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Enhancement in the End to End Quality Performance for Cognitive Radio Network

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ABSTRACT

In cognitive radio ad-hoc network, each CR observes different channel availability according to the primary user's activity. However, traditional ad-hoc network (such as MANET or WSN) usually operates on predefined channel, which remains unchanged with time In other word, cognitive radio ad-hoc network needs to consider the PU transmission to avoid any interference with the licensed user, which is entirely missing in traditional ad-hoc networks. The QoS of end-to-end routing in cognitive radio ad-hoc network depends on traffic load, number of potential channels in the route, the number of spectrum change events induced by PU, consideration of periodic spectrum sensing functions etc. In this paper we proposed a secure and enhanced model for the better end to end quality of services for the cognitive radio wireless sensor network, here our experimental comparative results shows that the our proposed methods gives better results than the existing techniques.

Keywords: Cognitive Radio, Quality of Service, Transmission Control Protocol, Wireless Mesh Network, Medium Access Control, Logic Link Control.

INTRODUCTION

Recent development of tiny, low-power, low-cost, and multi-functional wireless sensor nodes has been accelerated by advances in manufacturing, electronics, communication, and miniaturization. These sensors nodes are equipped with the capability of environmental sensing, data collection, data processing, and wireless communication. Therefore, wireless sensor networks (WSNs) can actively collect information and report events in a self-organized manner. WSNs have been widely used in a diverse range of applications, such as tracking, video surveillance, remote monitoring, localization and event-reporting. Recently, there are increasing research efforts on WSNs towards energy conservation, which reduces the requirement on memory and the complexity of protocol design with the rise of the Internet of Things (IoT).

The WSN is a wireless network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical environmental conditions, such as temperature, sound, vibration, pressure motion or pollutants, at different locations. WSN has significantly different communication constraints. The devices in such type of network are deployed in a huge numbers; they need the ability to assist each other to communicate data to a centralized collection point which is called a sink or a base station. The smallest devices are composed of a sensing unit, a radio, a processor integration of the sensor and having a power unit. The devices are capable of monitoring of a wide variety conditions such that temperature, humidity, soil makeup, pressure, vehicular movement, lighting conditions and noise levels, etc.[16].

In recent years, the number of embedded devices has increased and finally, they are envisioned to seamlessly connect to the Internet as the IoT. A typical wireless sensor network is composed of several sensor nodes and one sink node. Sensor nodes collect data and forward the data to the sink node. A typical architecture of a WSN is shown in Fig 1. Sensor nodes sense the environment and collect raw data. With local processing, sensors communicate with each other. If necessary, data aggregation is performed and the aggregated data is delivered to a sink. Users can have access to the data collected from sensors through the sink node by accessing the internet [4]. Sensor networks are often multi-hop and communication is typically data-centric rather than node or address centric. Sensor networks often have a many-to-one traffic pattern, which leads to a ``hot-spot" problem. Sensor networks should maintain a certain quality of service. The limited power, low radio range, potentially high density and an ever-changing environment pose difficulties in the design of efficient protocols for WSNs.

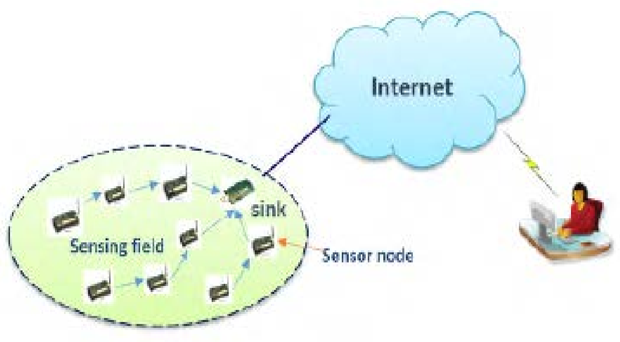

Fig 1: **A**rchitecture of a wireless sensor network.

The Radio spectrum is one of the most scarce and valuable resources. Cognitive radio is an exciting emerging technology that has the potential of dealing with the stringent requirement and scarcity of the radio spectrum. Such revolutionary and transforming technology represents a paradigm shift in the design of wireless systems. Cognitive (or smart) radio networks are an innovative approach to wireless engineering in which radios are designed with an unprecedented level of intelligence and agility. This advanced technology enables radio devices to use spectrum (i.e., radio frequencies) in entirely new and sophisticated ways. Cognitive radios have the ability to monitor, sense, and detect the conditions of their operating environment, and dynamically reconfigure their own characteristics to best match those conditions. Cognitive radios working on identify potential impairments to communications quality, like interference, path loss, shadowing and multipath fading.

The objective of this paper is to outline the current research trends in cognitive radio ad-hoc network architecture. To do so, the cognitive radio ad-hoc network architectures are divided into two categories, naming cluster-based architectures and non cluster-based architectures. It is assumed that this classification is useful and viable guidelines to network designers and field engineers for a given set of circumstances. The paper also presents an extensive comparison of different cluster-based architectures, where the dissertation is concluded with open research issues and possible future research directions.

The rest of this paper is organized as follows in the first section we describe an introduction of about the wireless sensor network and cognitive radio network. In section II we discuss about the overview of wireless sensor network, In section III we mentioned the proposed work and the experimental result study for the cognitive radio network, finally in section IV we conclude and discuss the future scope.

II OVERVIEW OF WSN

Wireless ad hoc networks are widely used in military and civil mobile communication, where fixed communications infrastructures (i.e., base station) are not available. Different from WLAN (Wireless Local Area Network), the ad hoc network is a multi-hop wireless network without a centralized coordinator. Each node works as a router to forward the packets from other nodes. In this special wireless network, TCP (Transmission Control Protocol) flows traverse multiple hops before reaching the destination node or sink node. To provide reliable communications in wireless ad hoc networks, it is critical to design an efficient TCP congestion control mechanism [9]. However, the performance of the wireless ad hoc network will be degraded if the traditional TCP protocol is utilized.

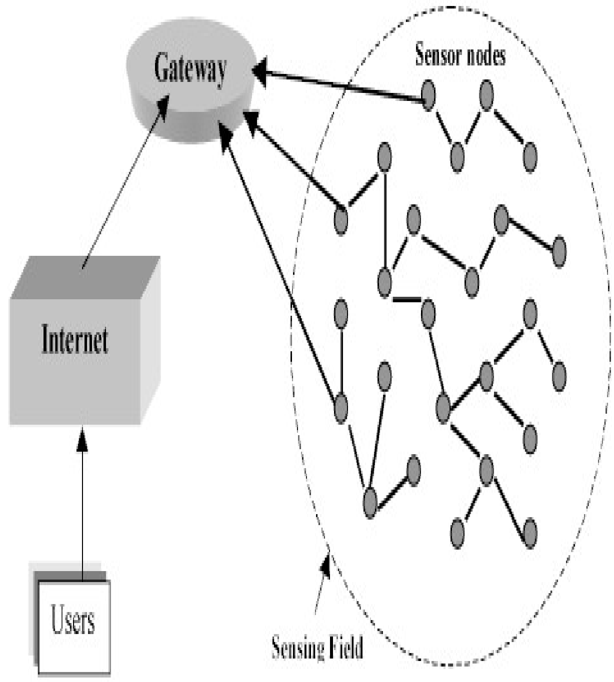

Fig 2: Overview of Wireless Sensor Network.

The reason is that TCP congestion control has an implicit assumption that any packet loss is due to the buffer overflow. In fact, as long as the buffer size at each wireless node is reasonably large, most packet losses are due to wireless channel contention, namely, MAC (Media Access Control) layer competition. Therefore, several cross-layer schemes are proposed to alleviate congestion in the wireless channel. For example, a cross-layer ECN (Explicit Congestion Notification) scheme was proposed to perceive the link congestion according to the retransmission counter at the MAC layer. In this scheme, the retransmission counter at the MAC layer is used as the congestion metric to trigger the ECN mechanism.

ECN is the explicit congestion notification mechanism of the IP layer. When network congestion occurs, the sender can adjust the congestion window and reduce the sending rate by the ECN mark from the receiver. WCCP (Wireless Congestion Control Protocol) was proposed to dynamically adjust the congestion window of TCP according to the channel business ratio, which presents the extent of channel congestion in a more accurate way. These cross-layer methods improve the efficiency and fairness of wireless ad hoc networks. However, the retransmission counter and the frame service delay are not precise enough to detect congestion from the MAC layer, while WCCP is too complex to implement in existing transport protocols [9].

III PROPOSED WORK & RESULT

In this section we discuss for the proposed method and the experimental result analysis with compare the existing techniques. With an increasing network size, a flat ad-hoc network faces scalability problem. A hierarchical architecture, such as cluster-based architecture, is essential to meet the scalability problems for ad-hoc network. The performance of the ad-hoc network may degrade once the size of the network increases. This is because with increasing network size, control overhead in ad-hoc network also surges. Clustering is one of the most widely investigated solutions for scaling down the ad-hoc network while maintaining the network connectivity. In clustering, the network is organized into logical groups depending on network characteristics and application requirements. Below figure depicts a cluster-based ad-hoc network where the network is logically divided into clusters (represented by dotted lines). There are three types of node in the network namely cluster member, cluster head and gateway.

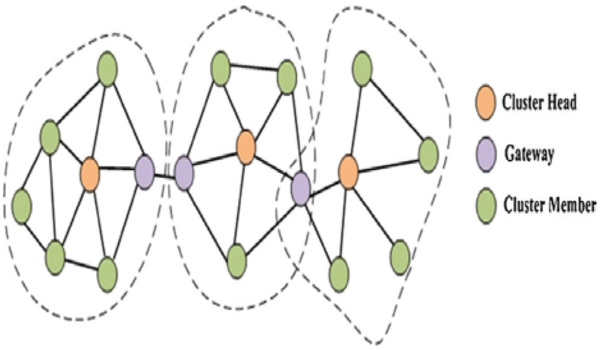

Fig 3: Clustering in ad-hoc network.

In our research work perform improve the performance of cognitive radio wireless sensor network in various services such as throughput, packet arrival rate and less delay. The proposed model written in matlab script language command provided by this simulator. The evaluation of performance of our proposed methodology in parameters like packet arrival rate from the source node to destination node, throughput between the both ends without any congestion and the end to end delay between the source node to destination node.

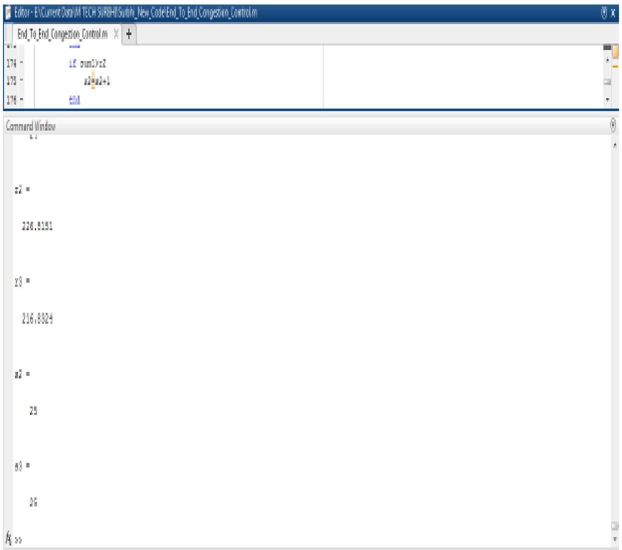

Fig 4: Shows that simulation scenario of Packet Arrival Rate for the performance evaluation of proposed method.

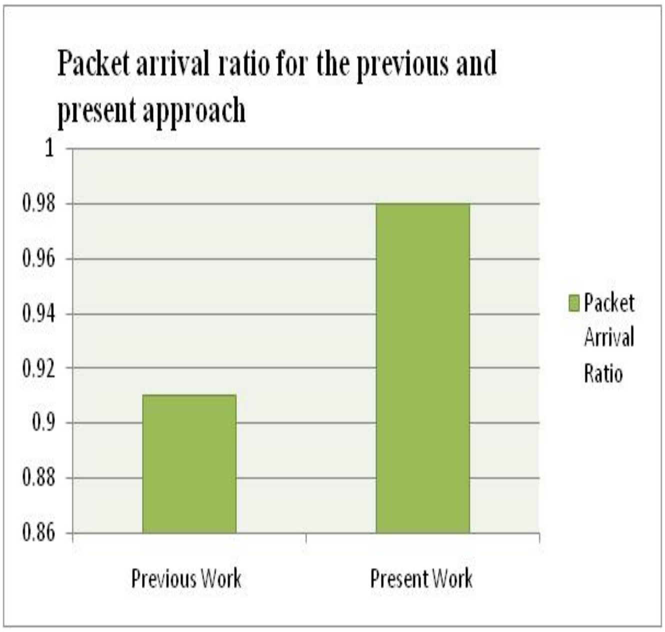

Fig 5: The above figure shows that the comparative performance evlaution graph for the Packet Arrival Ratio using the existing method and proposed method for the successful end to end qualtiy of services in wireless sensor networks.

IV CONCLUSIONS AND FUTURE SCOPE

For the best utilization of cognitive radio ad-hoc network, a robust architecture is essential. In this dissertation, a comprehensive survey on recently proposed cognitive radio ad-hoc network architectures with their strengths and limitations are discussed after that we find the problem statement regarding the quality of services. Considering the limitations of non-cluster-based architecture, implementing clustering techniques in ad-hoc network can bring several advantageous for the network. Clustering splits any large distributed network into smaller groups to leverage communication overhead. Control channel selection, cluster formation techniques, neighbor discovery schemes, re-clustering issues, intra-cluster communication method, etc. are main performance metrics that have been considered to evaluate the performances of the cluster-based architectures.

REFERENCES:-

[1] Dan Wang, Yi Song, "ECCO: A Novel End-to-End Congestion Control Scheme in Multi-Hop Cognitive Radio Ad Hoc Networks", IEEE TRANSACTIONS ON COGNITIVE COMMUNICATIONS AND NETWORKING, VOL. 5, NO. 1, MARCH 2019, pp 93-102.

[2] Mona Jaber, Muhammad Ali Imran, Rahim Tafazolli, Anvar Tukmanov, "5G Backhaul Challenges and Emerging Research Directions: A Survey", IEEE access 2016, pp 1743-1766.

[3] Pimmy Gandotra, Rakesh Kumar Jha, Sanjeev Jain, "Green Communication in Next Generation Cellular Networks: A Survey", IEEE access 2017, pp 11727-11758.

[4] Arun Kumar, Ming Zhao, Kai-Juan Wong, Yong Liang Guan, And Peter Han Joo Chong, "A Comprehensive Study of IoT and WSN MAC Protocols: Research Issues, Challenges and Opportunities", IEEE access 2018, pp 76228-73262.

[5] Furqan Jameel, Zara Hamid, Farhana Jabeen, Sherali Zeadally Muhammad Awais Javed, "A Survey of Device-to-Device Communications: Research Issues and Challenges", IEEE COMMUNICATIONS SURVEYS & TUTORIALS, 2018, pp1 -37.

[6] Khaled H. Almotairi, Xuemin (Sherman) Shen, "A Distributed Multi-Channel MAC Protocol for Ad Hoc Wireless Networks", IEEE 2013, pp 1-30.

[7] Michael Rademacher , Karl Jonas, Florian Siebertz, Adam Rzyska, Moritz Schlebusch, Markus Kessel, "Software-Defined Wireless Mesh Networking: Current Status and Challenges", THE COMPUTER JOURNAL, 2017, pp 1-16.

[8] Soufiene Djahel, Ronan Doolan, Gabriel-Miro Muntean, John Murphy, "A Communications-oriented Perspective on Traffic Management Systems for Smart Cities: Challenges and Innovative Approaches", IEEE 2014, pp 1-28.

[9] Huaguang He, Taoshen Li, Luting Feng, Jin Ye, "Frame Transmission Efficiency-Based Cross-Layer Congestion Notification Scheme in Wireless Ad Hoc Networks", MDPI 2017, pp 1-14.

[10] M.Rajesh, J.M.Gnanasekar, "CONGESTION CONTROL SCHEME FOR HETEROGENEOUS WIRELESS AD HOC NETWORKS USING SELF-ADJUST HYBRID MODEL", International Journal of Pure and Applied Mathematics, pp 519-537.

[11] Qamar Jabeen, Fazlullah Khan, Shahzad Khan, Mian Ahmad Jan, "Performance Improvement in Multihop Wireless Mobile Adhoc Networks", J. Appl. Environ. Biol. Sci., 2016, pp 82-92.

[12]VahidEsmaeelzadeh,ElaheS.Hosseini,RezaBerangi,OzgurB.Akan,"Modeling of rate based congestion control schemes in cognitive radio sensor networks", Elsevier,2015,pp 177-188.

[13] Alessandro Cammarano,Francesco Lo Presti,Gaia Maselli,Loreto Pescosolido,and Chiara Petrioli," Throughput-optimal Cross-layer Design for Cognitive Radio Ad Hoc Networks",IEEE 2014,pp 1-11.

[14] Asim Rasheed, Saira Gillani, Sana Ajmal and Amir Qayyum," Vehicular Ad Hoc Network (VANET):A Survey, Challenges, and Applications", Advances in Intelligent Systems and Computing · March 2017,pp 39-51.

[15] Lei Ding ,Tommaso Melodia, Stella N. Batalama,John D. Matyjas," Distributed resource allocation in cognitive and cooperative adhoc networks through joint routing, relay selection and spectrum allocation", Elsevier 2015,pp 1-18.

[16]Maqbool Shah, Muhammad Yaseen Khan, Haroon khan, Muhammad Noman Hayat, Syed Roohullah,"Congestion Control in Wireless Sensor Networks-An overview of Current Trends",

International Journal of Science and Engineering Applications,2016,pp 273-279.

[17] Zeinab Imadeldin Abasher Mohamed Ahmed, Dr. Khalid Hamid Bilal, Dr. Mustafa Mohamed Alhassan," Cognitive Radio Network Review", IJEAM,March 2016,pp 19-26.

[18] Rasneet Kaur, Madan Lal," Wireless Sensor Networks: A Survey", IJECT, June 2013, pp 102-106.

[19] LIU Yong-Min, WU Shu-Ci, NIAN Xiao-Hong," The Architecture and Characteristics of Wireless Sensor network", International Conference on Computer Technology and Development, 2009,pp 56-565.

[20] Nafees Mansoor , A.K.M.Muzahidul Islam ,Mahdi Zareei" Cognitive Radio Ad-Hoc Network Architectures: A Survey", Springer Science Business Media New York, 2014,pp 1-28.

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