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DIMINISHING DELAY WITH ROUTING AND RESOURCE ASSIGNMENT IN COGNITIVE RADIO NETWORKS

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ABSTRACT

Cognitive Radio (CR) is a emerging technology that enables optimal utilization of the of the spectrum. Reduction of delay and the maximization of the throughput should be satisfied which possess a challenge to the proposed cognitive mesh network. A collaborative routing and spectrum utilization with minimal interference with the use of on demand routing protocol finds a reliable solution of optimization. The evolved protocol is proposed to solve the spectrum sharing capabilities in the cognitive mesh networks. The existing protocol in cognitive network challenges aspects like hidden terminal, cross layer design communication in the established network.

Keywords: cognitive radio, on demand protocol, idle terminal, cognitive mesh network, routing protocol.

1. INTRODUCTION

Cognitive radio is a prototype for wireless communication in which either a network or a wireless node changes its transmission or reception parameters to communicate efficiently, avoiding interference with licensed or unlicensed users. Cognitive radio networks (CRNs) is an emerging wireless technology where it is able to change their transmission or reception . The cognitive radio has the Primary Users (PUs) that has the priority in the spectrum utilization within the frequency band that is licensed, and the Secondary Users (SUs) who can use the band opportunistically to access the spectrum without interfering with PUs. The cognitive radio networksis based on techniques like sensing of the spectrum and sharing of the spectrum. The cognitive radio network enables the network to overcome the challenges between with the traditional wireless networks. The challenges [12] could be routing between the multichannel, multi hop [7]between nodes and adaptabilities between the PU's and the SU's. Cognitive radio has a characteristic of cognitive capability where it is able to sense the radio environment that captures the temporal and the spatial variations in the spectrum environment and the reconfigurable capability which helps the cognitive radio to program dynamically according to the environment that occurs.

Routing mechanism is the process of selecting the paths in a network along which the network traffic is sent. Packets of data moves from source to destination. The process of moving the data packets across a network from one host to another host is called as routing. The routing in cognitive radio network (CRN) must be aware of the spectrum availability, spectral environment, user activity, route maintenance.

a) Energy efficiency

Energy efficiency is a challenging problem and should be addressed in the design of every layer in the wireless protocol stack [11]. Among various network control and operation functions, routing has a direct impact on the energy efficiency of the underlying wireless network. Considerable [10] energy is spent on transmitting and receiving data. It can have various definitions, such as the network operating time until the first node depletes its energy, when a certain percentage of nodes fails, or when the network is partitioned, depending on the specific network and application under consideration. At each node, some information is generated and should be delivered to the gateways via multihop routes.

b) Cross-layer design and optimization

Cross layer design refers to the sharing of information among the layers for efficient use of resources and achieving high adaptability. Cross layer [11] design is usually formulated as the optimization problem, with optimization variables and constrains. Cross-layer design is appealing because it reduces the search space for optimal adaptation. The unique characteristics of wireless networks require joint consideration of parameters previously located in different layers. There has been increased interest in developing wireless networking protocols and algorithms with increased interactions among various layers. These would illustrate increased performance between the nodes.

2. OBJECTIVE OF THIS PAPER

The system consists of the random based network [9] and the cognitive sensing mesh network [4] in order the efficient utilization of the nodes which would be idle. The nodes that will be already used will be have the capacity which will be reduced that will lead to the decreased in the performance and the delivery of the data packets [3] .the nodes could be efficiently utilized with the help of the idle nodes by capturing them through cognitive sensing and forwarding them through a structure where both the random as well as the mesh network could be utilized in remote places where the availability of the mobile network would be scarce in place were mesh cannot be formed under water or in places like forest and so on. Distribution of the traffic will become tedious which will be demonstrated through this paper about the effective utilization and working of the nodes with the

efficient protocols and the graphs to the exiting and the proposed are demonstrated and compared.

3. RELATED WORK

In a network nodes can operate as a host as well as a router, for forwarding the packets to other nodes in the network that may not be within direct transmission range of each other. The random network nodes are chosen randomly as source and destination. The path is instantly created in the network and does not have any base infrastructures in the traditional network [5]. Lack of centralized control and all possible node mobility many give rise to many issues at the different layers of the network .The nodes find the shortest path and establishes the connection between them in order to transfer the packets from source to destination .The knowledge about each nodes and their efficiency will not be determined in this form of randomized network which will lead to inefficient delivery of data to their respective destinations. The routing protocol used to this type of network will lead only to find the shortest path in the network. The delay and the energy of the nodes remains a lack of process with the randomized network. The transmission of nodes needs to be regularized so that it is efficient enough to reach the aimed receiver while inducing minimal interference at other nodes. The efforts shown are pointed at projecting networks with small numbers of nodes. When the nodes are optimally placed in a disk of unit area, and the range of each transmission is optimally selected, a wireless network cannot provide a throughput. This would lead to the formation of a cognitive mesh network. The presence of disjoint node paths sustains the network lifetime by contracting the energy reduction rate of a specific node.

4. EXISTING SYSTEM

The cognitive mesh network consists of information about all the nodes in the network. Cognitive mesh network [1] improves capacity throughout the network significantly. Large volumes of traffic are expected to be delivered since it is able to utilize spectrum resources more efficiently. It aims at designing routing and resource allocation protocols to minimize the end-to-end delay. Traditional [4] wireless mesh network are disputed by the scarcity of the wireless bandwidth needed to satisfy the high-speed demands of existing wireless applications. The mesh networks with cognitive sensing [1] are meant be used to provide broadband access to places that are rural, tribal, and other under-resourced regions that can specifically form a group. The DORP protocol is used in establishing the connections between the nodes as well as using the efficacious method of forwarding the packets. The disjoint [6] design in the random traditional network cannot accommodate more than a single traffic streams on the network it is based on. While in our existing design scheme we use the DORP [1, 2]scheme that is able to accommodate all the streams of data. It is also includes that the existing protocol outperforms the DORP protocol for all values of primary idle probability and for any number of traffic streams.

a) Routing challenges in cognitive radio network

- Wait: If the primary users will leave the channel soon, the secondary user can wait until the channel is cleared.
- Switching channels: If there are multiple channels, the secondary user can also try to sense other channels and resume the transmission until an available channel is found.
- Re-routing: If there is only one channel and the primary user [2] does not leave quickly, a new path has to be found in order to resume the data traffic.

But the existing system faces a critical situation where the nodes become scare and unavailability of node in the location where it will be difficult for communication without the formation of mesh network will become a problem and disconnection of simultaneous communication will become a lag in the performance [7,8] and might have delay in the end to end communication between the nodes. These can be overcome by the proposed system where we try to bring both the actions of the random and cognitive mesh and the results of the performance are come together.

5. PROPOSED SYSTEM

The proposed system establishes the formation of both the random or the traditional form of communication as well as the mesh formation in the network. The nodes approximately 50 are created and are formed as groups to form the cognitive mesh communication. Sensing of the nodes is done in order to learn the information of each node before the traffic between the nodes takes place is shown in Figure-1.

Figure-1. Group formation and sensing.

The nodes are sensed with the information collected between the nodes helps each node to cognitively sense the information of each node during the transmission in order to reduce the delay between the nodes. The nodes are identified as cognitive sensing nodes

in order for the utilization of the radio bandwidth. Node 40 is identified as the source which is trying to communicate to the different destination in each group nodes. The nodes that have to power to forward the packets are identified which helps to forward the packets without any loss to their respective destinations. The sensing nodes have high capability of cognition will be able to identify the licensed and the unlicensed users in the network. Figure-2 illustrates the work done on each node and their labeling. The rest are marked as idle nodes.

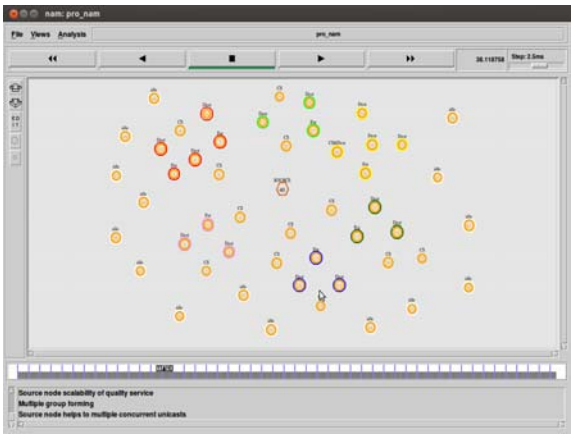

Figure-2. Work identification of each nodes.

The proposed work enables us to identify the idle nodes and also make use of them effectively such that there is no delay in communication in places where we aren't able to from the meshed network. The protocol here that is used is the DORP which help for the transmission of the data without any obstructers that leads to data loss in the packets. The Figure-3.shows how the idle random source node communicates with the grouped mesh network and the data is transferred to the idle destination node. The communication will pass through both type of network for the transmission and effective utilization of all the nodes.

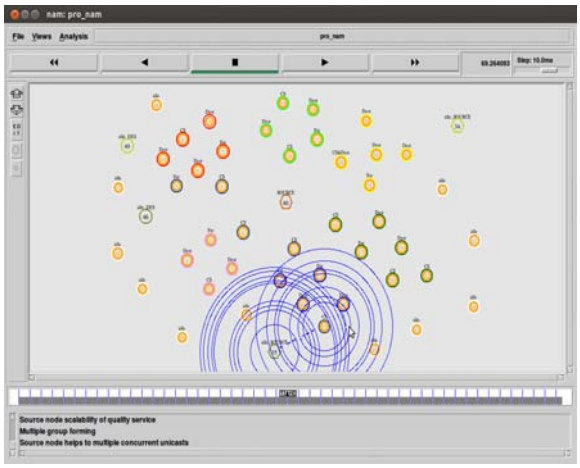

Figure-3. Idle source and destination communication.

6. RESULTS AND DISCUSSIONS

The Network Simulator 2 tool is used and the graph is generated for the comparisons of the results that are obtained. The delay between the packets on the existing system between the nodes in the proposed mesh network as well as the proposed system communication is compared between the nodes during the transmission of the packets. Here we are able to identify the drastic fall of delay in the proposed system which is indicated in green color. The x axis consists of the time limit and y axis consists of the delay ratio in both the systems and the result is compared. The comparison is shown in Figure-4 below between two different colors.

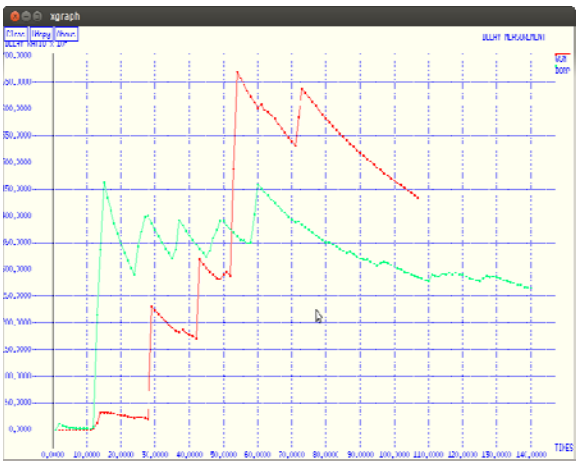

Figure-4. Comparisons of delay during transmission.

The delivery of the packets between the nodes can be identified and compared between the systems. This figure 5 shows how the loss of packets can be reduced using the cognitive and random network and the effective utilization of the idle nodes used when they will be needed for transmission.

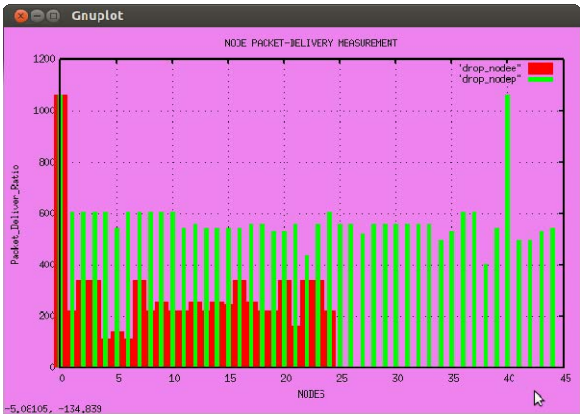

Figure-4. Loss control during transmission.

7. CONCLUSIONS

The efficient use of all the nodes during the data transfer will lead to time slotted delivery of the packets as well as the protocol that is used here can also be

improvised to improve the performance which we have achieved to more than 50% by reducing the delay and loss of the packets. At an idle node the probability of the dropped packets can be reduced using the linear integer algorithms and the sub optimal solutions in the cross layer communication within the network channel, the joint scheme can accommodate traffic streams with 75% higher arrival rates compared to the other scheme.

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