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DYNAMIC SPECTRUM ALLOCATION FOR COGNITIVE CELLULAR NETWORK

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ABSTRACT

In today's world of mobile communication is lagging because of limited spectrum allocation or improper allocation. So we have to use technique called as Dynamic spectrumallocation. we see that in urban area like metro cities the use of spectrum is at very high but in rural area or less populated area the use of the spectrum is less in this we are using the spectrum for secondary user when my primary user is not using the spectrum as soon as primary data is resent for transmitting immediately the secondary data is not sent this is done by placing nodes in ns 2 software and coding is done in such way that after transmission of every 20 data packets the secondary user will send one packet this is done by fedora in ns-2 softwareNumber of wireless devices in ISM bands increasing Wi-Fi, Bluetooth, Interference performance loss Other portions of spectrum are underutilized Example: TV-BandsFCC approved in 2004 to allow unlicensed users to use unoccupied TV bands Mainly looking at frequencies from 512 to 698 MHz Requiressmart radiotechnology Spectrum aware, not interfere with TV transmissions

Keywords: cognitive radio,dynamic spectrum allocation,AOMDV protocol, ns2 software.

I. INTRODUCTION

Background of Dynamic SpectrumA radio may be able to sense the current spectral environment and have memory of past transmitted and received packets along with their power, bandwidth.The main challenges with DS are that it should not interfere with licensed users and should vacate the band when required. For this it should sense the signal faster

Example of Spectrum utilization

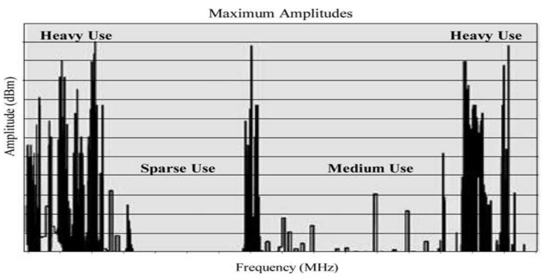

Figure 1:sprctrum utilization

figure 1 shows the spectrum utilaization of a network which has heavy use meduim use and sparse use this use may vary according to time and consumer

Dynamic spectrum allocation

The main object of dynamic spectrum access that break the spectrum access barrier and enable networks and their end users dynamically access spectrum.This class of network is called as cognitive radio network

Architecture for Cognitive Radio Ad Hoc Networks

The components of the cognitive radio ad hoc network (CRAHN) architecture, as shown in Figure The components of the CRAHN architecture can be classified in two groups as the primary network and the CR

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network components. The CR component may itself be composed of different types of networks, such as, wireless sensor networks, mesh networks and mobile ad hoc networks. Moreover[5]

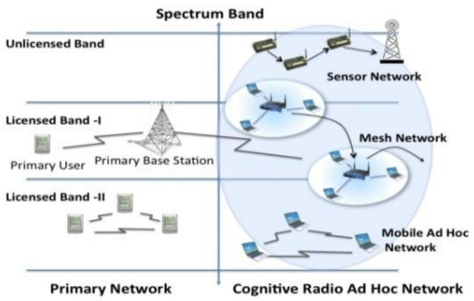

Figure 2:Spectrum band

figure 2 shows spectrum band allocation cognitive radio ad hoc network in this primary user is licenced user and secondary user is unlicenced user it shows communication of mobile ad hoc networks

They may exist in overlapped areas, without thpresence of a centralized controller or an established network infrastructureAs shown in the chief components of the CRAHN architecture are described next

Primary Network: This is referred to as an existing network, where the *primary users* (PUs) have a license to operate in a certain spectrum band. If primary networks have an infrastructure support, the operations of the PUs are controlled through *primary base stations*. Due to their priority in spectrum access, the PUs should not be affected by unlicensed users.[5]

CR network (or secondary network): This does not have a license to operate in a desired band. Hence, additional functionality is required for CR users (or secondary user) to share the licensed spectrum band. Also, CR users are mobile, and can communicate with each other in a multi-hop manner on both licensed and unlicensed spectrum bands. However, they do not have direct communication channels with the primary networks and rely on their local observations during their operation.

Unique to CRAHNs, different types of networks may have different considerations. As an example, for mesh networks, the protocol design must support high volume traffic, while for sensor networks, the focus is on energy conservation and preventing packet drops. Mobility conditions must be inferred, often relying on local estimation, and the end-to-end protocol operation needs to be adapted accordingly.[2]

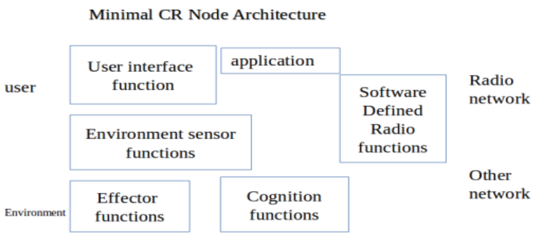

Figure3:minimal CR Node Architecture

Spectrum Sensing in CRAHN's-As collaboration among theCR users is a key enabling factor during spectrum sensing we specifically focus on the following directions in this project

Cooperation Optimization: In a CR ad-hoc network, CR users send their sensing information over the channel through multiple access techniques, and thus, their individual traffic adds to the probability of packet collisions. By requesting the sensing information from several CR users, the user that initiates the cooperative sensing improves the accuracy but also increases the network traffic. However, this also results in higher latency in collecting this information due to channel contention and packet re-transmissions.

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Common Control Channel (CCC): The CCC facilitates neighbor discovery, helps in control message exchange between CR users, and also supports the spectrum sensing coordination. A key challenge is the design of such a CCC that is "always on" and is not affected by the PU activity. The CCC may have limited scope, reaching the set of nodes over a region where mutually common PU channels are affected. It may also change over time, adapting to the dynamic spectrum environment. In this project, we shall devise a based on OFDM that allows flexible sub-carrier allocation to meet the above design goal[5].

Cognitive Sensor Networks: Interferer Classification and Transmission Adaptation Wireless sensor networks (WSNs) are being increasingly deployed for a variety of environment monitoring, commercial utility metering, military and surveillance applications. These applications necessitate reliable data delivery with minimum packet loss due to external interference. When these sensors form a CR network, some of the transmission channels may be affected by the PU. In a noisy environment with multiple interferer types, such as wireless LANs and commercial microwave ovens, distinguishing between them becomes a key challenge. By identifying the presence of a specific type of an interferer, the sensors can choose their transmission channel, and also adapt their packet scheduling at the MAC layer to avoid packet losses due to interference[2]

The problem of detecting the above interferer characteristics is addressed in this project by: 1.Experimentally profiling the spectral characteristics specific to wireless LANs based on the IEEE 802.11b and commercial microwave ovens2.Devising a scheme for identifying interferer type based on matching the observed and the previously obtained spectral data.3.A channel selection scheme is proposed, where the sensors choose the channels not occupied by WLAN transmissions and not affected by the radiation caused by microwave ovens.4.Proposing a transmission adaptation scheme at the MAC layer, in which, the sensor packets are scheduled between two WLAN transmissions, and during the off times of the duty cycled microwave ovens.[3]

Advantages of AOMDV over AODV

- It reduces the packet loss by up to 40%
- Achieves a remarkable improvement in the end-to-end delay
- AOMDV also reduces routing overhead by about 30% by reducing the frequency of route discovery operations

II. AOMDV ROUTING PROTOCOL

This is extension of AODV that is single path routing protocol.Based on distance vector routing concept and uses hop by hop routing approach. In AOMDV, RREQ propagation from the source towards the destination establishes multiple reverse paths both at intermediate nodes as well as destination. We present AOMDV, an on-demand multipath distance vector protocol for mobile ad hoc networks. AOMDV is based on a prominent on-demand single path protocol called AODV. AOMDV establishes multiple loop-free and link-disjoint paths. Performance comparison of AOMDV with AODV using ns-2 simulations under varying node speeds shows that AOMDV provides a factor of two improvements in delay and about 20% reduction in routing overhead, while having similar packet delivery fractionThis protocol gives the loop freedom and disjointness of alternate path.

There are two issues in loop freedom1.Which path is advertise.2.Which path is accept.[4]

Multiple Loop-free Forward Paths

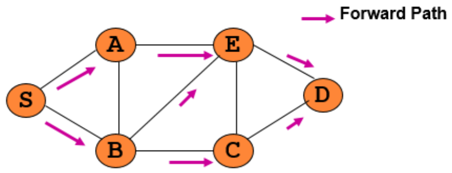

Figure 4:data path

figure 4 shows multiple loop free forward dat apathes in cr in the project we set nodes at 6 different points and the possible no of paths shown in figure

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Equipment Requirement • Multiband and integrated narrow/wideband antennas with miniaturization constraints for small-sized devices • Flexible frequency carrier tuning • Variable duplex distance between forward and reverse links for frequency-division duplex based systems • Flexible receiver signal filtering

Simulation is based on NS-2 There are several reasons to base on NS-2 for the development of cognitive radio simulators. 1. First, NS-2 is open source software2. Second, NS-2 already provides many radio models, such as 802.11, 802.16

III. WORKING

In this we work for dynamic spectrum allocation for cognitive radio in this by using AOMDV protocol though in this project we done the project In NS-2 for the output. In this at project level we set total 6 nodes for communication and for packet transmitting as cr will sense current and past packet transmission and reception we are waiting for absence of primary signal if the primary signal is present within the 5 sec then secondary signal will not transmit but after waiting 5 sec secondary signal will transmit and after sending every 20 packets 1 secondary packet will transmit There are two main types of cognitive radio, full cognitive radio and spectrum-sensing cognitive radio. Full cognitive radio takes into account all parameters that a wireless node or network can be aware of. Spectrum-sensing cognitive radio is used to detect channels in the radio frequency spectrumwe have to use technique called as Dynamic spectrum allocation. we see that in urban area like metro cities the use of spectrum is at very high but in rural area or less populated area the use of the spectrum is less in this we are using the spectrum for secondary user when my primary user is not using the spectrum as soon as primary data is resent for transmitting immediately the secondary data is not sent this is done by placing nodes in ns 2 software and coding is done in such way that after transmission of every 20 data packets the secondary user will send one packet this is done by fedora in ns-2 software.

Spectrum sensing method

- Energy detection technique
- Match filter technique
- Cyclostationary technique

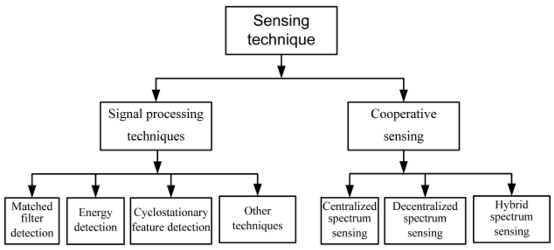

Figure 5:this figure shows types of sensing technique

Energy Detection method:This type of detection there is no need to have any prior knowledge of the transmitted signalIt just computes the energy of a received signal to decide whether a detected signal was a noise or primary user's signalFor decision a threshold value should be set according.

IV. RESULTS

In the below graph we can see the nodes of cr which is implemented by ns 2 software the node can be placed at any point This nodes are placed with x axis and y axis along with the no. the no. starting from 0 to 5 total six nodes are there and we saw the multiple path for the communication in CR after that the primary data packets are send from the desired path and secondary data path aredropped after tramitting 20 data packets 1 secondary data packet is transmitted hence communication is done between nodes

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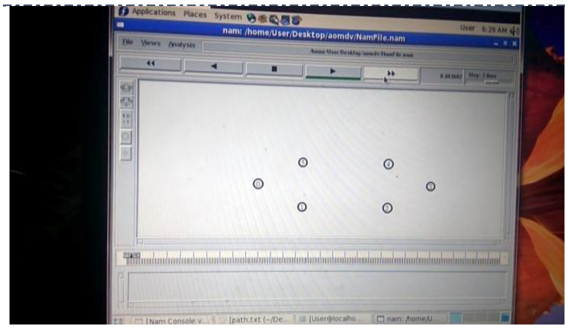
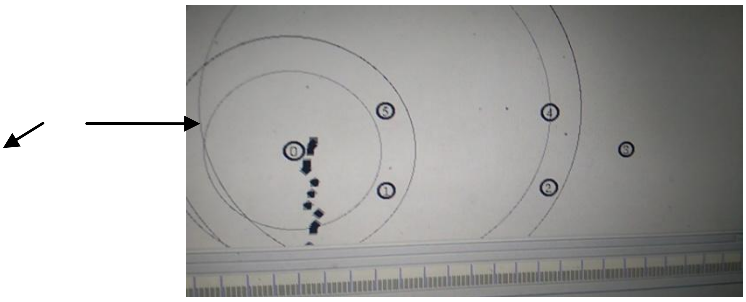
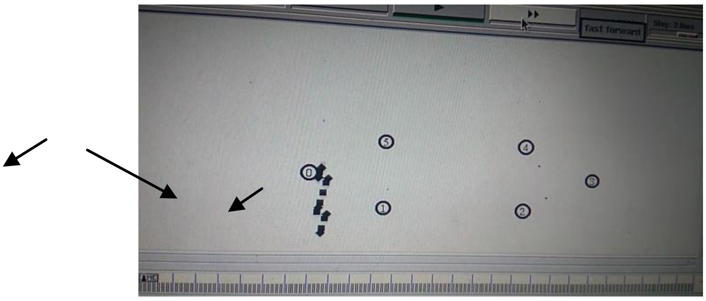


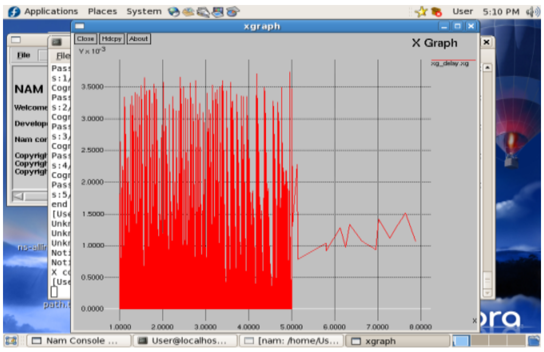
Graph 1:in this graph we can see the nodes which placed to create CR in ns 2 software



Graph 2:From above graph we can see the sensing packets at all nodes at past and present time of the cr basically it will sense the path of the data packet transmission and reception and the packets which are dropping is secondary data



Graph 3:In the graph above the secondary data is transmitted from point 0-5-2-3 this is the path



GRAPH:4

Graph 4:In this graph we can see that presence of the primary signal and packets are transmitting and after that only one packet of secondary signal is transmitted

V. CONCLUSION

In this we are using the spectrum for secondary user when my primary user is not using the spectrum as soon as primary data is resent for transmitting immediately the secondary data is not sent this is done by placing nodes in ns 2 software and coding is done in such way that after transmission of every 20 data packets the secondary user will send one packet this is done by fedora in ns-2 software

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