IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)
e-ISSN: 2278-1676,p-ISSN: 2320-3331, Volume 12, Issue 6 Ver. III (Nov. – Dec. 2017), PP 56-62
www.iosrjournals.org

Performance evaluation of Proactive and Reactive Routing Protocol in Cognitive Radio

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Abstract: *Over last few years, wireless mobile communication is facing many challenges which has resulted in development of new technology products such as 802.22, wireless mesh network, software define radio[1]. The ongoing challenges such as spectrum management, spectrum sensing and its effect on other devices [5]. One such network is cognitive radio network, which gives the flexibility for designing strategies during communication in white space that are created in the licensed primary users. In this paper we have tried to show the comparison results proactive and reactive protocols in cognitive radio environment.*

Keywords: *cognitive radio, mobility, routing spectrum sensing.*

Date of Submission: 06-12-2017 Date of acceptance: 30-12-2017

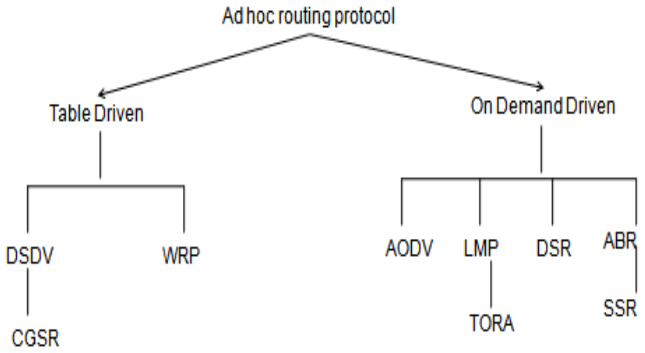
I. Introduction

A mobile Ad hoc network is cluster of mobile nodes that are free to roam arbitrary. Every node is also a router and may have many host or multiple wireless communication devices. When data is sent to the target node which is not under range of source, then other nodes act as intermediate routers for communications between source and target. The ad-hoc networks are self organized distributed, multi hop network without using any external infrastructure. Due to constant changing of nodes and network it is difficult to maintain the performance of various parameters of adhoc network and also causes route instability.

According to FCC, many spectrum bands uses only bounded geographical areas for only small duration of time and the average utilization is between 15% and 85% [1, 2]. The dynamic spectrum is access use by secondary user of the licensed spectrum of primary users without interfering the communication of primary users. This was possible only when Software Define Radio (SDR) came into existence. SDR can be programmed in such a manner that it can use wide range of band whenever it is required with limited delay [2, 3].Such SDRs are known as cognitive radio. Cognitive radio is an intelligent transreceiver that can be configured reconfigure available channels in the wireless spectrum and can change the transmission parameters resulting congestion free communication [1].

A. Proactive and reactive protocols

Ad hoc network works on various design protocol for varied mobile mobility and for Optimization constraint. These protocols are classified as proactive and reactive protocol.



Flowchart 1

B. Proactive protocol

Proactive protocols are table driven routing protocols that have to be travelled to every node that has some information to be updated every single time. It is ready to use instantaneously. Since it is a table driven routing

protocol, there is a need for updating the table every time. The nodes have to be maintained very large routing tables periodically [7, 8].
For example: - DSDV [9], WRT [10]

C. Reactive protocol

This is on demand routing protocol. On the other hand it will take place only when a node has a data packet to transmit such as AODV [13], DSR [14] and TORA [15].Both proactive and reactive protocols have advantage and disadvantages. Proactive protocols have to update the table periodically from every node so the result is fast in process. They react fast and the network topology changes due to up to date route discovery process.

Whereas reactive protocol save bandwidth and energy. Due to on demand route discovery process when there is heavy traffic load, network can be congested by overloading of packets on route request so for now we have taken AODV, AOMDV and DSDV for our comparative result in cognitive radio environment.

D. Cognitive radio and cognitive network

Cognitive radio will identify the white spaces of radio spectrum that are currently not working for license user and assign it to secondary user.

E. Cognitive network

The network are often working in dynamic condition where nodes energy, channel allocation, table maintenance, user mobility can change every time. All the above factors are responsible for degrading the network performance full stop network service so should be maintained so that quality of service should be good [11, 12].

A cognitive network is a network that can be aware of ongoing network conditions and then plan, decide and act on those condition. That is cognitive networks should be self aware and self managing ability to maintain and have full knowledge about their own network environment.

F. Cognitive routing

Routing is a process of finding suitable path for communication. To transmit data from one node to other each node should select particular path to the trans receiver. Convectional routing process was to find the shortest path to improve the efficiency. But to find shortest path is not always effective. There are other parameters such as capacity, link length, delay, throughput, interference except trust that are effect that can affect the route discovery process. Cognitive radio is the combination of network and routing process.
The newly upcoming cognitive radio has promised to allow the cognitive radio used to transmit in white spaces of license spectrum the following are the steps that are present in cognitive radio cycle
1) Spectrum sensing
2) Spectrum decision,
3) Spectrum sharing,
4) Spectrum mobility

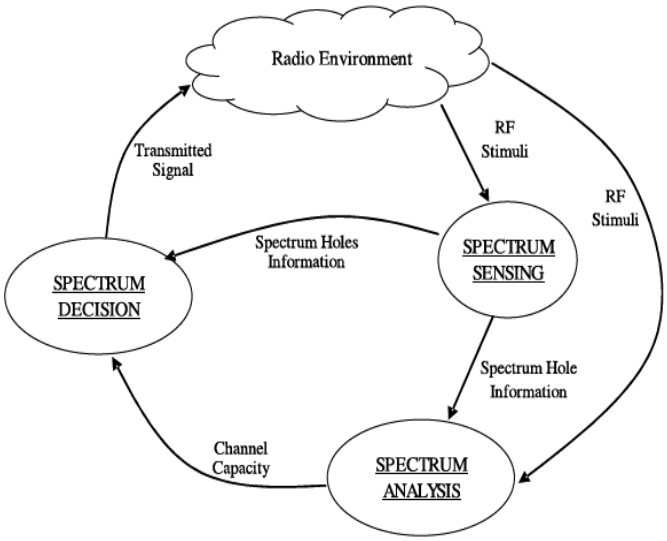
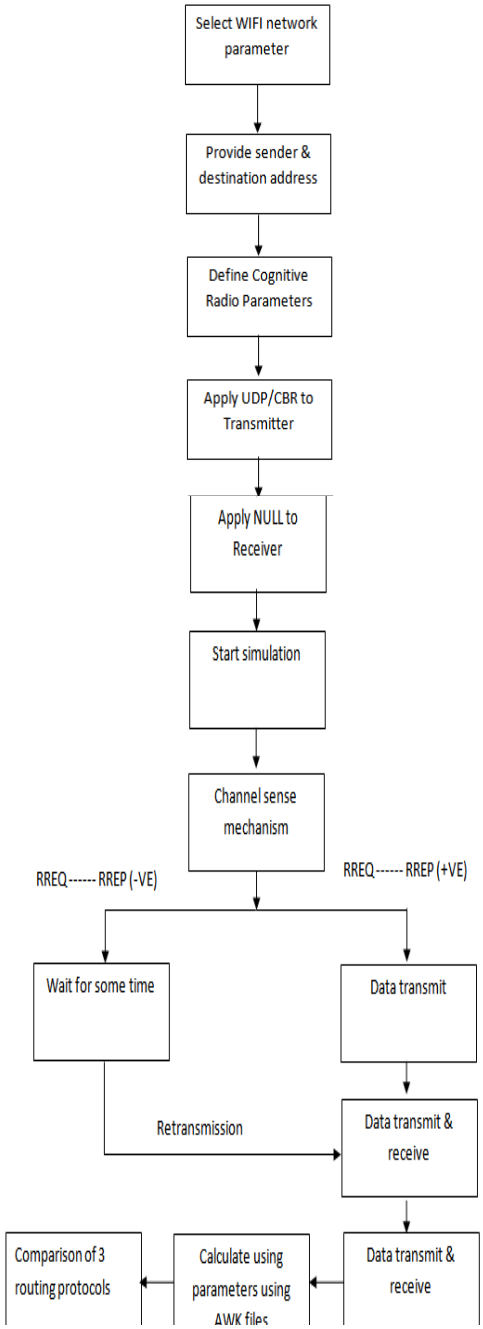


Fig.1. Cognitive radio cycle [1]

II. Methodology

In this paper we have done the comparative analysis of AODV, AOMDV and DSDV routing protocols in cognitive environment using some of the parameters such as throughput delay and packet ratio delivery. Your first we have selected Wi-Fi network parameters then source node and destination node as selected and particular address are assigned to the transmitter and the receiver NODE.



Flowchart 2

We have done introduced the cognitive network parameters. Parameters such as Network sensor network delay network mobility. By applying all the protocols to the network one by one to the transmitter that is sender and null to the receiver. The cognitive radio network will first since the band, if the transmission is there that is if the network is busy it will wait for some particular duration of time. It will against sense it and if it finds that the band is vacant it will transmit the data packet to the next node and then to the receiver.

III. Results

In the table below we have compared the result of all the three routing protocols along with their graphs for the parameters throughput delay and packet delivery ratio in percentage.

Table1. Simulating parameters

Parameters	**Values**
MAC	802.11
Number of nodes	40
Data length	40
Area (X-Y)	600*600
Routing Protocols	AODV, AOMDV, DSDV
Antenna	Omni directional antenna
Packet Size	700 bytes
Packet interval	0.06 sec
Traffic type	UDP/CBR

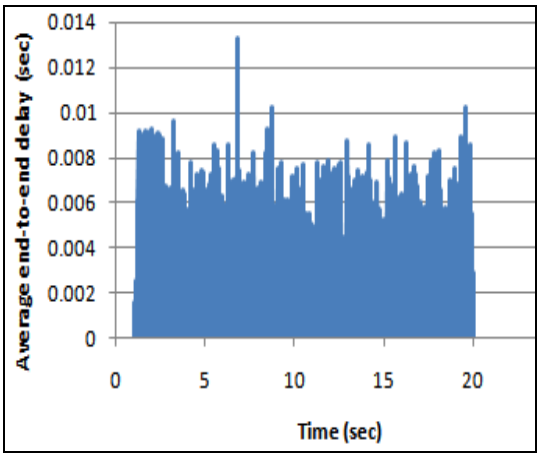


Fig 2 Average end to end delay (AODV)

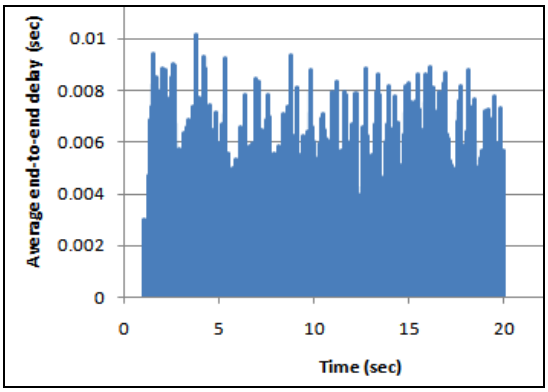


Fig 3 Average end to end delay (AOMDV)

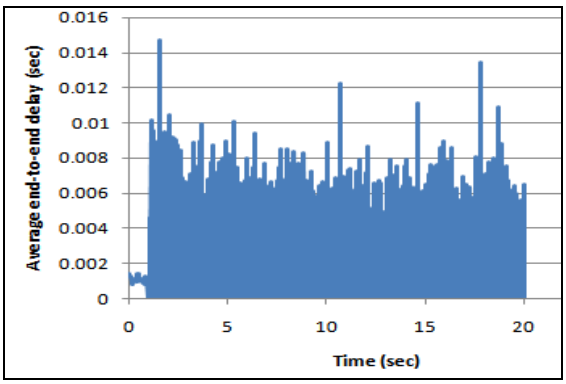


Fig 4 Average end to end delay (DSDV)

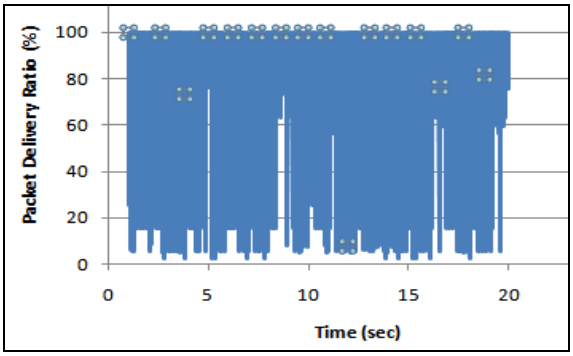


Fig 5 Packet delivery ratio (AODV)

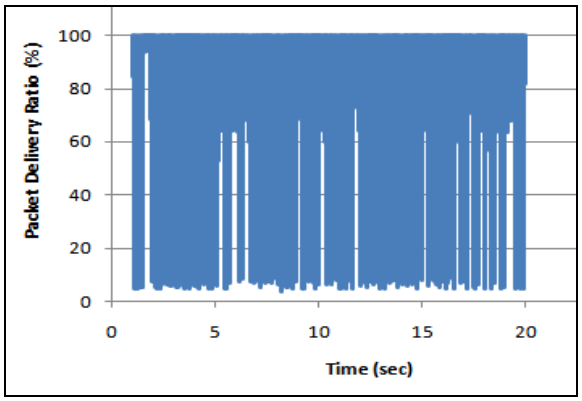


Fig 6 Packet delivery ratio (AOMDV)

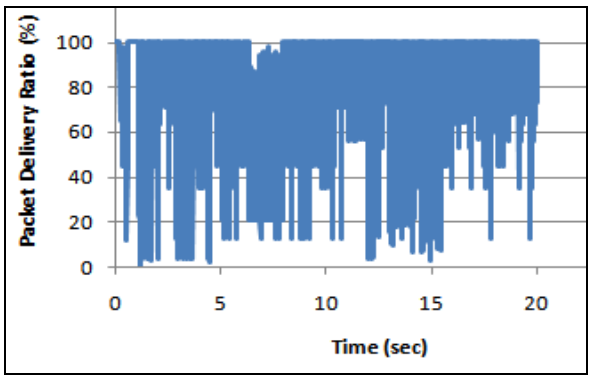


Fig 7 Packet delivery ratio (DSDV)

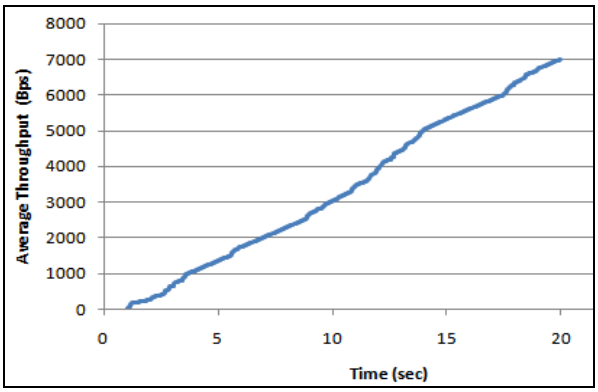


Fig 8 Average throughput (AODV)

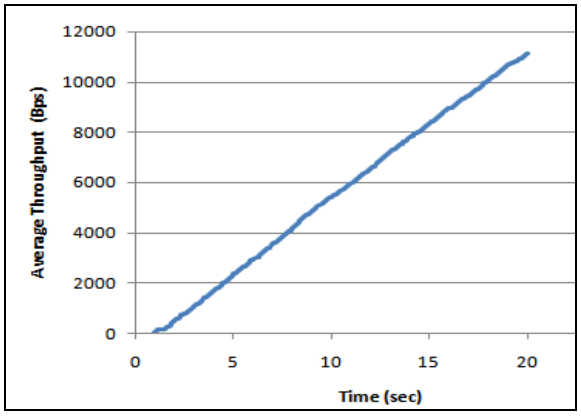


Fig 9 Average throughput (AOMDV)

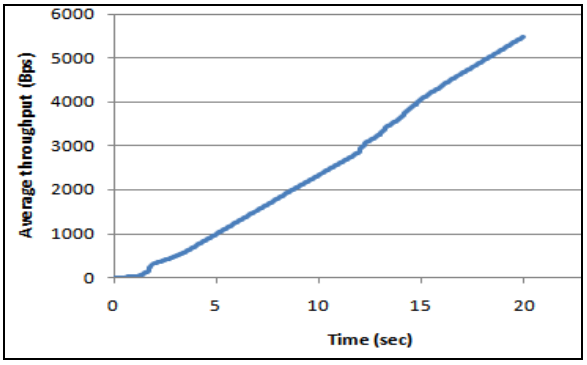


Fig 10 Average throughput (DSDV)

Routing Protocol	Throughput (bps)	Delay (sec)	PDR(%)
AODV	3525.805	1.031 ms	92.72
AOMDV	5767.600	1.023 ms	94.814
DSDV	2787.235	1.096 ms	87.86

Table 2 Comparison table

IV. Conclusion

We have gone through many routing protocols in different networks and also in cognitive radio environment that solves many issues like traffic, interference pathfinder for secondary user. Above all, AODV is giving us the most optimized result.

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IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) is UGC approved Journal with Sl. No. 4198, Journal no. 45125.

Shruti Singh Roy "Performance evaluation of Proactive and Reactive Routing Protocol in Cognitive Radio." IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) 12.6 (2017): 56-62.