

Optimized Traffic Management for Improving Energy Efficiency in Cognitive Network



Shobhit Verma, Vikas Raina

Abstract: The overhead of a particular node in the network depends on its position with respect to packet forwarding capability and total number of nodes in direct contact. In cognitive radio network, the primary user detection and spectrum sharing mechanism consist of two phases which constitutes the sensing mechanism as first phase and second phase of spectrum allocation along with finalization of end to end route of communication. The base idea of route establishment is derived from AODV protocol while proposing the traffic aware route establishment mechanism. The established route by using simple AODV has lots of limitations such as common router selection in multiple routes due to its direct being in range scenario. The proposed method shows significant improvement in energy efficiency due to reduction in overall overhead based on dual valued information exchange based route establishment mechanism. The results obtained thorough simulations show better improvement in the energy efficiency.

Keywords: Cognitive radio network, traffic aware route establishment, spectrum allocation, dual valued information exchange.

I. INTRODUCTION

Range detecting for asset portion to optional clients (SU) is basic need of intellectual radio system. The necessary data in such manner is detecting the nearness of essential clients (PUs) and consequently finishing up the accessibility of range for SUs. The detecting cycles required for this range accessibility estimation straightforwardly reflects as far as vitality utilization for each detecting endeavor. Likewise when asset usage is being done, as being brief individual from the system, SUs are additionally required to detect the nearness of PUs for utilizing the range with no missed data.

Range detecting and convention based systems are required to be treated as two distinct situations to the extent generally speaking system contemplations concerned. The detecting system improvement establishes the range assignment and utilizing techniques while convention is answerable for parcel based effectiveness the board where whole correspondence of information bundles alongside control parcels are liable for vitality utilization from a specific member hub in the system. The opposite side of the system is comprising of range chief and controller in which

detecting instrument assumes significant job while asset assignment to SUs on transitory premise. The vitality proficiency in range detecting and vitality productivity in by and large correspondence, together when considered, may frame all out vitality effective subjective system for a wide range of clients (Pus and SUs).

Then again, it is fundamental to consider different consequences for various organize execution parameters of the system while accomplishing vitality proficiency. The necessary parameters in such cases can be throughput, bundle conveyance proportion and start to finish delay. The exhibition of these parameters are likewise required to be adequately ideal while accomplishing vitality effectiveness. This paper centers around the vitality effectiveness advancement in subjective system. The relative investigation of proposed convention configuration is finished with existing subjective system with AODV steering convention and IEEE 802.22 based WRAN MAC convention, which shows noteworthy improvement in vitality productivity.

II. RELATED WORK

The psychological system progression and its need according to request in correspondence innovation have set off the musings of different explores on the planet for accomplishing vitality effectiveness with in general better execution of the system. The idea of asset portion to auxiliary clients for authorized band access have assortment of ideological arrangement given by different analysts. A portion of the ideas and strategies are tended to here which particularly center around vitality productivity in intellectual arrange as earlier objective.

A. Rawat et al [1], have given a structure of the convention named as Fan Access Protocol. Detecting cycles and detecting system are considered alongside traffic the executives for bursty traffic situations are considered while structuring the convention. The ideal briefest way steering alongside arrange design situations are given. The bunching of the system is finished utilizing Realization, coordination and steering stages, which are improved utilizing molecule swarm streamlining based calculation. The calculation is dependable to enhance the area based traffic of the considerable number of hubs in thick system. The impact enhancement is liable for improving vitality effectiveness. The similar examination demonstrates critical improvement in the outcomes.

Muhammad Talha Zia et al [2], have given overview of vitality productive subjective system MAC conventions. The vitality effectiveness versus convention instruments are considered while looking at different techniques. In nuts and shell the paper gives the stage to contemplations for vitality proficient plan of MAC conventions in psychological radio system.

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* Correspondence Author

Mr. Shobhit Verma*, Bachelor of Engineering degree, Electronics and Communication, GRKIST, Jabalpur.

Dr. Vikas Raina, Assistant Professor, CSE department, Mody University

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Zhutian Yang et al [3] have given a structure of vitality proficient MAC convention. In the convention named ECR-MAC uses sale based component for picking the range is utilized. The introduction based telecom is dependable to assemble the data identified with the range accessibility. The offer based next bounce choice system decreases noteworthy range detecting cycles and furthermore encourages every hub for picking the correct jump for sending the parcels. This decreases critical system overhead and subsequently lessens the vitality utilization. The hub thickness is considered as principle powerful parameter for bookkeeping the vitality utilization. The near examination of different conventions show that the creator's convention outflanks as far as vitality proficiency.

Faisal Fayyaz Qureshi et al [4], have given vitality productive MAC convention in which parcel conglomeration plan is utilized for vitality effectiveness in the system. This technique is dependable to lessen arrange overhead by collecting the bundles from higher layers and sending them consecutive when range is made accessible for correspondence in time based sharing system. Because of this system throughput expands altogether contrasted with existing DSR and 802.11b MAC based system. The augmentation in throughput likewise ensures the improvement in bundle conveyance proportion and vitality effectiveness.

NehaShirke et al [5], have given bunching strategy for vitality proficient directing in psychological system. The convention structured by creators comprise of group participation expiry clock. At the point when this clock lapses, the bunch free hub uses detecting system to detect the nearness of PU and if nearness whenever discovered, this data gets engendered to different neighbors through one jump hi parcel component. The one hi bundle system is answerable for social affair the data of steering table of bunch free hubs and henceforth nearness of essential client. Along these lines all the SUs get data with respect to specific range inhabitance by PU. The presentation assessment is accomplished for vitality utilization which shows the improvement in vitality effectiveness. Alongside these parameters throughput and start to finish deferral are additionally investigated which likewise show proficient execution contrasted with different conventions.

Ashish Semwal et al [6], have given course choice component in psychological radio sensor arrange. The directing convention which separation between the hubs, number of streams that hub is occupied with are the fundamental parameters considered. For estimation and determination of hubs in a course the remaining vitality and required measure of vitality are fundamental parameters considered dependent on which specific hub is considered being in the course.

Rana Asif Rehman et al [7], have given plan of postponement and vitality mindful steering convention for intellectual system. The course demand bundle is answerable for evaluating the vitality utilization of the whole way from source to goal. The postpone metric during spread of this solicitation bundle is additionally utilized for choosing the correct hub in the course for limiting the deferrals. Thusly vitality proficient alongside postponement enhanced course is chosen and dependent on which whole vitality effectiveness is accomplished alongside upgraded throughput and deferral of whole system. The near investigation shows

that creator's strategy beats as far as different system execution parameters.

Ying Liang et al [8], have given adaptable defer steering convention helpful in subjective radio system. The information parcel structure is adjusted by creators by including originate before field which is capable to trade hubs related data while sending the bundles among hubs in the course. The hubs which the postpone limit are permitted to take an interest in the course by using each time new data got from originate before field. This instrument lessens the general postponement in the psychological system and furthermore shows better execution when contrasted and different conventions defer examination.

III. PROPOSED WORK

The proposed work consist of modification in RREQ packet structure while selecting a node as a member of a route. The RREQ forward mechanism from all nodes will be responsible for sending the network overhead and bandwidth type level information to its next neighbor. The next neighbor will add this information in its routing table information for further processing which is required at the time of forwarding the RREP packet. The additional information while sending RREQ will add 4 bytes of packet length which is very small addition and hence has negligible effect on the RREQ overhead. The route establishment with the use of this modified version of RREQ will be able to select the route with less traffic and bandwidth awareness. Figure 1 shows the block diagram of the proposed work.

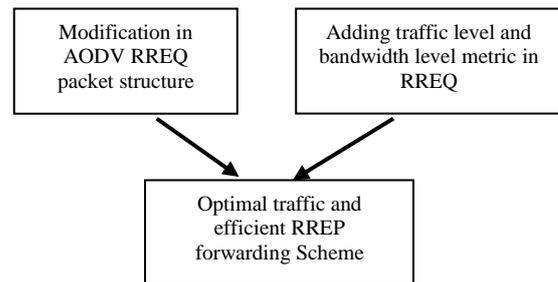


Figure 1: Block diagram of proposed system.

The original RREQ packet of AODV protocol is modified as shown in figure 2. The fields T and B are used to fill and send traffic level and bandwidth level allocated to particular node while forwarding the RREQ. The resulting mechanism will be responsible to add this information to the routing table of RREQ receiving node and this receiving node will further fill its own paramters and forward I further to its neighboring node. This way RREQ will reach to its intended destination node which ultimately will make use of this information while selecting RREP forwarding node in RREP unicast sending method. This way selected node will be having less traffic and optimum bandwidth selection strategy which may improve the efficiency in terms of minimizing the packet loss ratio due to dropping f packets during queue full conditions during heavy traffic conditions and thereby saving the consumption of energy while generating and transmitting these dropped packets.

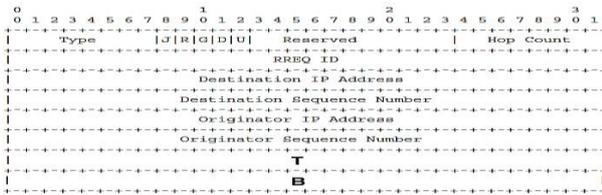


Figure 2: Modified RREQ packet structure

The significance of T and B fields is based on level structure which is defined by means of rating number within 1 to 5.

Table 1: rating level of T and B

Rating level	T	B
1	Heavy traffic	Good bandwidth
2	Less heavy	Normal bandwidth
3	Normal traffic	Less bandwidth
4	Less traffic	Shortest bandwidth
5	Very less or no traffic	Unstable bandwidth

Algorithm1:

1. Get traffic and bandwidth information
2. Fill in T and B fields
3. Forward RREQ
4. If (forwarding node) Add B and T with respect to address in routing table

Algorithm2:

1. Get routing table vectored information with traffic and bandwidth
 2. Set centroid1 = Minimum traffic vector
 3. Set centroid2 = Maximum bandwidth Vector
 4. Cluster vectors using K-medoid
 5. Select Minimum traffic and maximum bandwidth routing information from clustered group1.
- Send RREP using selected routing address

As per algorithm 1, RREQ will reach at the destination along with updating of information about traffic and bandwidth in entire network.

At the destination node when it is time to send RREP, k-medoid clustering approach will be used to select less traffic and maximum bandwidth node from list of nodes in the routing table. The balancing of traffic and bandwidth is main benefit of using clustering approach. The process of selecting RREP forwarding node will be as per algorithm 2.

IV. RESULTS:

The performance evaluation is done by configuring the network using configuration parameters as shown in table 1.

Table 2: Network configuration

CBR Packet Size	256,512
Number of nodes	5, 20, 30, 50, 100
Simulation Time	150.0 Seconds

Energy Consumption analysis:

Table 3: Energy consumption for packet size 512

Number of nodes	PROPOSED	EXISTING
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5	27.3	34.27
20	29.63	38.44
30	41.35	61.31
50	62.45	68.6
100	78.23	96.35

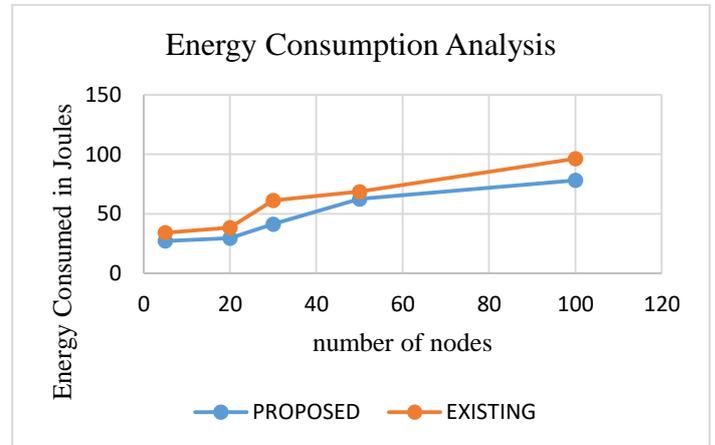


Figure 4: Energy consumption analysis for packet size 512 bytes

Table 4: Energy consumption for packet size 256

Number of nodes	PROPOSED	EXISTING
5	28.35	37.93
20	36.45	54.92
30	41.23	59.37
50	72.34	75.23
100	82.26	103.25

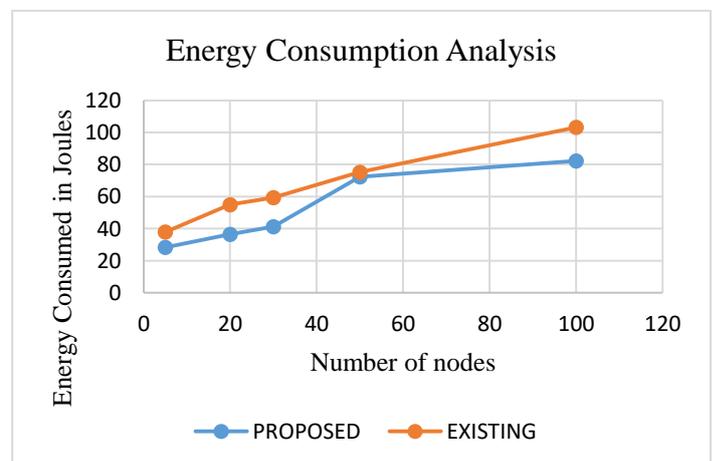


Figure 5: Energy consumption analysis for packet size 256

Annotations:

1. It is found that, when rout selection mechanism constitutes the selection of nodes based on traffic and bandwidth level which enhances the efficiency.
2. The efficiency with comparison to existing system shows significant improvement.

V. CONCLUSION

The proposed method in paper shows significant improvement in energy efficiency with contribution to route selection mechanism based on traffic and bandwidth awareness. The optimal traffic management due to proper route selection mechanism leads enhancement of energy efficiency and shows better applicability to cognitive radio network.

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AUTHORS PROFILE



Mr. Shobhit Verma, has done his Bachelor of Engineering degree in Electronics and Communication from GRKIST, Jabalpur in the year 2004. His master's degree is in Digital Communication from SRIT, Jabalpur in the year 2009. He is a Ph.D. student in ECE department of School of Engineering and Technology, Mody University, Laxmangarh, Rajasthan. Member of IEI, ISTE.



Dr. Vikas Raina, has done Ph.D in ECE in 2018. Completed Mtech. in ECE in 2011 and B.tech in ECE in 2004. Had a 15 years of teaching experience. Presently working as an Assistant Professor in CSE department of Mody University. He is a member of CSI.