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Enhancing Quality of Service Detection Service with Priority Approach in Medium Access Layer

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ABSTRACT: Increase in on-demand services and real time applications in network demands for Quality of Services (QoS). Quality of service is more challenging to promise in mobile networks than in most other type of networks, because the network state changes as the nodes move and network state information is generally inaccurate. Distinguishing the required packets, availability of resources, in secure medium and routing it through efficient path are challenging tasks. Mobile ad-hoc network are complex and their routing techniques has various additional criteria such as power, stand time to consider. The traditional techniques are involved in identification of proper shortest path and packets flows through it, but various other characteristic such as power, bandwidth and traffic requires a modern approach to handle the packets. We propose a model to route packets through the discriminated path using neural network. Each node is provided with updatable node value to determine the efficient path. Reinforcement learning technique is used for weight determination of the host in the MANET.Network Simulator ns2 is used for simulation and results are favorable.

Keywords: QoS, MANET, Dijkstra's Algorithm, AOMDV, SAC and CLC.

Abbreviations: QoS, quality of Service; MANET, mobileadhoc network; AOMDV, Ad hoc On Demand Multipath Distance Vector ; sac, session admission control ;CLC, cross layer communication

I. INTRODUCTION

Quality of Services (QoS) denotes the overall performance of a network provided to the end user. QoS involve in reserving the resources for certain protocol services and provide quality in terms of many aspects. QoS is affected by various aspects and packets those migrates involve in various problem such as low throughput, dropped packets, errors, latency, out-of-order delivery. Streaming media, video conferencing, telepresence, online games and other buffering application requires QoS to be established effectively [1].

Mobile ad-hoc network is a type of ad hoc network that can change locations and configure itself on the fly. QoS in MANET is a challenging task to achieve since various factors drives the quality. Resource such as power of the mobile node and frequent migration of the host are to be considered for resource management. Normally the bandwidth is shared for various traffic criteria. Fig. 1 shows the separation of bandwidth that is used widely over the network.

Managing bandwidth over types of services leads to decrease in quality during peak quality service transmission. So we proposed a network model over the neural network technique to determine the discriminate path for the packets. Neural networks are computational models designed from neural network of living organism. Each node in the neural network holds a threshold value to determine the output from the system. Neural network are used for various complex tasks and we proposed a simple neural learning technique to enhance the QOS. Reinforcement learning involves in determination of data from the environment by the agent. Data are usually from the environment parameter such as bandwidth, power of node etc. Neural network determines the exact path with the weight determined from the reinforcement learning.

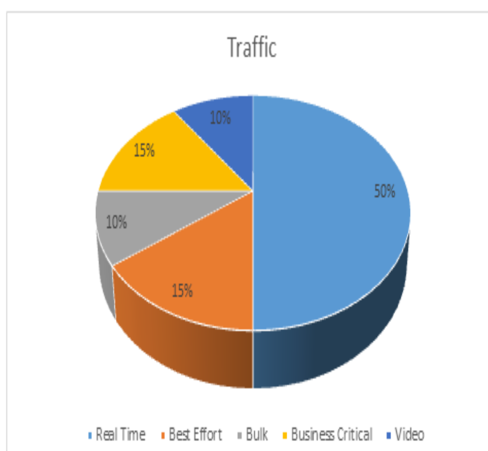


Fig. 1.Traffic resource assignment.

Packet transmission involve in identification of path to the destination and sending the file over the network. Determination of efficient path over the network is identified using various routing algorithm. In general, the shortest path from the source to the destination is calculated by Dijkstra's algorithm [2]. The packet which requires QoS are transmitted through the allocated bandwidth. But various factors such as power of mobile host and migration mechanism are not considered for transmission. In the proposed work, the algorithm provides a separate packet route for QoS enabled packet transmission. The snooze technique ensures power saving and priority packet transmission allows for transmission through efficient path.

II. LITERATURE SURVEY

Jae-Hyun Cho and et all proposed an adaptive way of diving quality levels. Based on the distribution of candidate component services, the range of the quality level is dynamically decided. The proposed approach reduced the failure rate of service composition by keeping the computational time reasonably low. The model deals with Np problem and reduces the time variations.

The Ad hoc On Demand Multipath Distance Vector (AOMDV) has a enhanced routing protocol for effective data transfer. Vidwans *et al.*, (2014) improved the QoS performance of AOMDV protocol and is called Enhanced AOMDV (EAOMDV).On the basis of queue length, the routing capability of AOMDV protocol is enhanced. In this method, the queue length has handled the data and network performance has improved. The performance of both the protocol has been measured on the basis of performance metrics and packet loss [2].

Lal *et al.*, (2013) deals with challenging task to transmit video streaming over mobile ad-hoc networks. They discussed an effective QoS aware routing protocol (QARP) which uses the cross-layer communication (CLC) and session admission control (SAC) methods to afford QoS assurances in terms of network bandwidth. QARP performs QoS aware route detection by considering the effects of both inter-contention and intra-contention during the route detection phase. Data sessions for which a route with mandatory bandwidth are acknowledged into the network by our SAC process. Existing periodic message arrangements are extended for exchange the QoS conditions of nodes to reduce the effect of mobility indefined QoS aware routing method. Furthermore, two methods are projected to handle the QoS destructions caused by dynamic characteristics of video traffic and network mobility during data transmission [3].

Rout *et al.*, (2009) proposed a method to use clustering along with that the probabilistic approach to find the quantity of lively and snooze nodes at a particular time and control the network construction of mobile network [4].

III. PROPOSED WORK

In the proposed work, energy can be preserved by monitoring the neighbor nodes to which it communicates. Depending upon the snooze technique, the network topology saves the power by controlling it and dispensing work load to neighbor nodes. It uses priority method to improve the packet transmission among nodes in the network by distracting the transmission through the efficient path. Table 1 shows the Updated Dijkstra's Algorithm Routing Table

Table 1: Updated Dijkstra's routing table.

Information stored at node	Distance to reach node	Low Priority Weight Node	Medium Priority Weight Node	High Priority Weight Node

Dijkstra's algorithm stores the routing information into table and uses for transmitting packets to the destination node. Weight column holds values determined using reinforcement learning from various parameters. Priority is classified as three categories as low, medium and high. Real time services are assigned to high priority packets. The priority packets possess blocks hold information about the priority assignment [3].

Updating Dijkstra's table requires update message from routers so that MANET may have migration which changes node location. Routing Information Protocol (RIP) is commonly used standard to exchange routing information among hosts. We have updated RIP with fields that require data for neural approach. RIP act as an agent to provide values for neural node. Table 2 shows the RIP protocol header

Table 2: RIP Protocol header.

8 bits	16 bits	32 bits
Command	Version	Unused
Address Family Identifier		Route Tag
Priority Value		Priority Type
IP Address		
Subnet Mask		
Next Hop		
Metric		

Command - There are five commands used such as Request, Response, Trace on (obsolete), Trace off (obsolete) and Reserved.

Version - The RIP version number

Address family identifier –RIP carry routing protocol for various different protocol. Thus this field indicates the type of IP address it indicates.

Route Tag - Route tag delivers a method of unraveling internal Route Information Protocol routes i.e., routes for networks within the RIP routing domain from external RIP routes.

Priority Value – Priority value calculated from the QoS parameters

Priority Type - type of priority type such as low, medium and high

IP address - Destination IP address.

Subnet mask - IP address to produce the non-host portion of the address. No subnet mask has been comprised for this entry result in zero entry.

Next hop - Immediate next hop IP address to which packets to the destination quantified by this route entry should be forwarded.

Metric - This metric is the sum of the costs associated with the networks that would be navigated in getting to the destination. It signifies the total cost of receiving a datagram from the host to that destination.

IV. PRIORITY VALUE CALCULATION

Priority value: It is the threshold value for the node which identifies the effective shortest path for QoS support. Various parameters are used to calculate the priority value and determine the suitable path for packet transmission [4].

Bandwidth: The measurement of bit-rate that is consumed during data communication. High bandwidth is required to provide QOS with less traffic.

Power: Mobile host in MANET may have battery source as their power source. The ability to withstand the transmission of packets determines the quality and persistent nature of host are determined by power consumed.

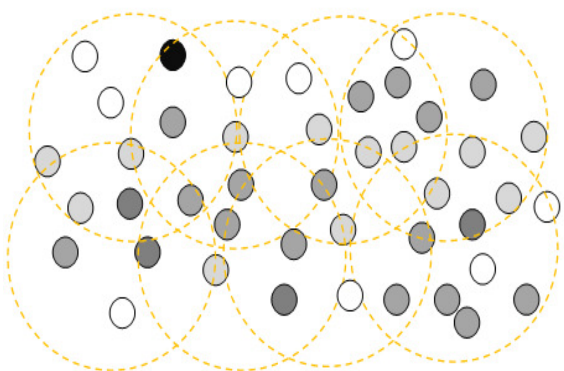
Traffic: Rate of number of packets transmitted in the network. Lower traffic determines the efficiency and is used for high priority packets.

Let Pt be available power value, Bt be available bandwidth and Tt be the available traffic. Bmax be the maximum bandwidth and Tmax be the threshold traffic.

$$\text{Priority Value,} \quad P \propto \frac{Pt \times Bt}{Tt}$$

$$\text{Priority value,} P = \frac{Pt \times Bt \times (Tmax - Tt)}{Pmax \times Bmax \times Tmax}$$

V. HOST CLUSTER TECHNIQUE



Region	Priority Value
Dead Region	0-0.19
Low Level	0.2-0.39
Critical Level	0.4-0.59
Medium Level	0.6-0.79
High Level	0.8-1

Fig. 2. Cluster arrangement of wireless node in MANET with Priority Value.

Gathering of wireless devices is linked with each other in active manner. The nature of network changes automatically due to mobility nature and with frequent changes in number of wireless device in the network. A group of wireless devices like sensor nodes that are talented of processing and transmitting the packets are called as Clusters [5]. Each node in the cluster possesses priority value to provide quality of service. Fig. 2 illustrates the formation of cluster with regional classification. Each node lies under the region that is used to identify the nature of the node.

Cluster Chaining Process: Fig. 3 projects Cluster with chaining process. It contains group of wireless nodes that has high priority value. It is considered as a block of nodes that transmits the packets. Cluster binding technique is defined as the joining of each node in a gathering that creates a strong transmission of packets with higher priority value(6). When a packet enters into the colony, inner groups are formed with higher priority value. Using neural routing algorithm it finds the nodes to move and reach the other inner group. This inner chaining method may operate efficient nodes in the network.

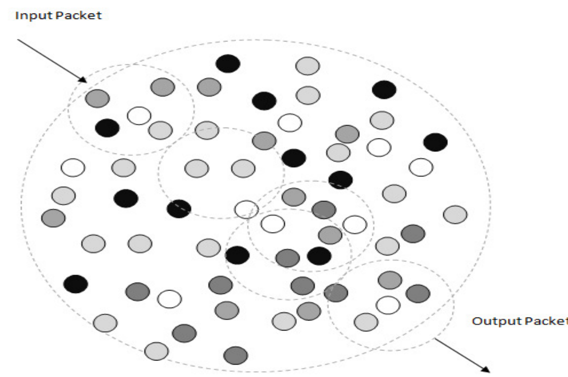


Fig. 3. Cluster Chaining Process.

VI. NEURAL ROUTING ALGORITHM

ClusterClusterFormation(NeuralNodes nodes)
Begin
Cluster newColony;
Initialize Pt,Bt,Tt,Pmax,Bmax and Tmax.
Foreach Node in nodes
Begin
PriorityValue=$\frac{Pt \times Bt \times (Tmax - Tt)}{Pmax \times Bmax \times Tmax}$
newCluster.PriorityValue=PriorityValue;
If(PriorityValue> 0 And PriorityValue<1.99)
Node.region=Dead;
If(PriorityValue> 0.2 And PriorityValue<3.99)
Node.region=Low;
If(PriorityValue> 0.4 And PriorityValue<5.99)
Node.region=Critical;
If(PriorityValue> 0.6 And PriorityValue<7.99)
Node.region=Medium;
If(PriorityValue> 0.8 And PriorityValue<1)
Node.region=High;
If(Node.region!=Dead || Node.region!= Low)
newCluster.AddNode(Node);
Return newColony;
End
NeuralNodeRouting(Node[] nodes,Packet packet)
Begin
Foreach(Nodes[] in Group of Nodes)
Begin
ClusterFormation((Nodes[])*);*
End
If(packet.Priority==High)
SendPacket(packet,HighPriorityRouting)
If(packet.Priority==Medium)
SendPacket(packet,MediumPriorityRouting)
If(packet.Priority==Low)
SendPacket(packet,LowPriorityRouting)

VII. ILLUSTRATION

Fig. 4 shows the network of wireless nodes that are linked with neighbor node. Let A be source and I be destination node. Each node has neural value associate with it. Rounded dotted line describes the wireless accessible path.

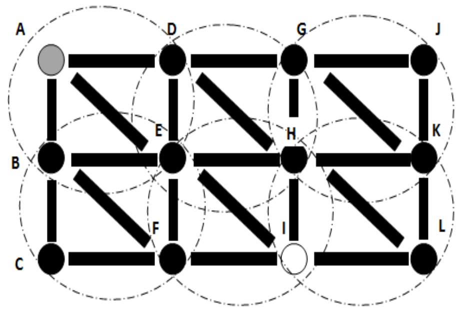


Fig. 4. MANET with Neural nodes.

The possible shortest path from A to I are:
AEI, ADEI, ABCFI,ABEI, ADGHI, ADHI,ADGJKLI, ADGJKHI
Dijkstra's algorithm may predict AEI will be proper shortest path. But due to varying factors such as power, bandwidth and traffic in network, QoS may be difficult through shortest path. So each node calculates the priority value and forms a cluster. When a high priority packet arrives from node A to I, the neural node decides the route to transmit the packet. For instance, ADEI is decided for QoS high priority packet transmission [7]. Other prioritized packets are routed to the AEFI route since if packets are routed to AEI route; this may affect the traffic collision in the EI link. So for each priority, packets are transmitted to the destination node [8].

VIII. RESULT AND OUTPUT

This proposed method is simulated by using NS2 simulator and Table 3 shows the parameter used in the simulator.

Table 3: Simulation Parameters.

Stimulator Time	1300s
Number of Nodes	65 each cluster
Routing Protocol	AODV
Traffic Type	Constant Bit Rate
Shortest Path Algorithm	Dijkstra's algorithm
Channel	Wireless Channel
Energy Model	Energy Model
Minimum Initial Energy	5.23 joules
Antenna Type	Omni Antenna
Interface Queue Type	Drop Tail

Dijkstra's algorithm is stimulated with proposed routing table. Dijkstra's algorithm is modified with neural node and separate routing pattern is calculated from proposed algorithm. Fig. 5 shows the stimulated result of cluster that routes the packet with high priority. Link is formed between efficient priority valued nodes to constitute the routing path.

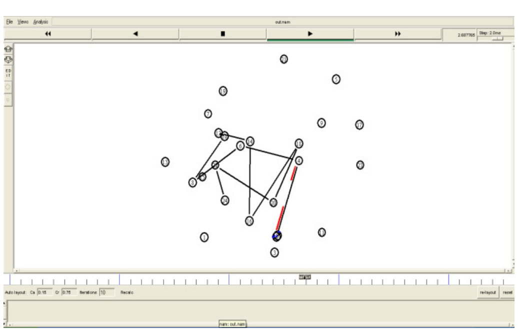


Fig. 5. NS2 Simulation Output.

A group of 95 nodes are simulated as clusters. Each node holds different priority value calculated by proposed algorithm. We compared the result from normal routing protocol that transmit packet with the shortest path using Dijkstra's algorithm. A simulation with the mixture of all priority valued packets is transmitted in the network. Fig. 6 shows the graph with rate of high priority packets transmitted with respect to time using normal Dijkstra's algorithm.

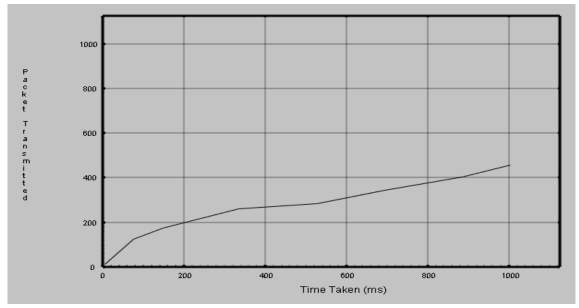


Fig. 6. Packet TransmissionVs Time taken using Dijkstra's algorithm.

Fig. 7 shows the graph with rate of high priority packets transmitted with respect to time using Discriminate Neural Routing model with modified Dijkstra's algorithm.

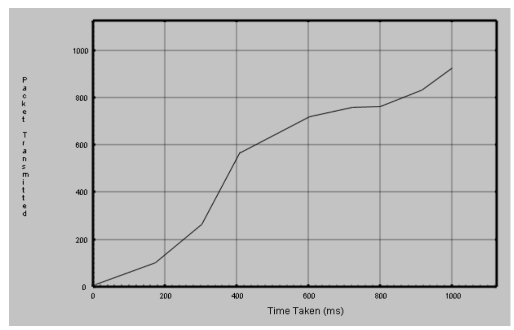


Fig. 7. Packet Transmission Vs Time taken using modified Dijkstra's algorithm.

Proposed model delivered an effective quality-of-service compared to existing model. Table 4 explains the key difference in each and every time span snapshot over the transmission of packets.

Table 4: Comparison Result.

Time taken	Existing model	Proposed Model
0	0	0
100	152	98
200	203	184
300	223	32
400	345	533
500	362	632
600	374	703
700	283	788
800	394	793
900	414	835
1000	436	893

IX. CONCLUSION

Our proposed algorithm uses neural network technique to route the high prioritized packets to provide quality of services. Cluster formation technique identifies the efficient node that can play a key role in QoS. Priority value determines the node weight for neural network. Chaining technique effectively couples the nodes in cluster to provide efficient packet transmission. Depending upon the packet transmitted, our proposed network possesses a discriminate route to route the packets.

X. FUTURE WORK

Our future work may enhance the proposed model to provide reuse of QoS discriminate route when there is no high priority packet to transmit.

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Conflict of Interest. The authors declare that there are no conflicts of interest regarding the publication of this paper.

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