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Enhancing QOS in Hybrid Wireless Networks Using a Distributed Routing Protocol

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Abstract**— Wireless communication is one of the most vivacious areas in the communication field today. This technology is biggest contributions to mankind. Wireless communication involves the transmission of information over a distance without help of wires, cables or any other forms of electrical conductors. The wireless communication supports dedicated quality of service required for wireless applications. A hybrid wireless network is an extension to an infrastructure network, where a mobile host may connect to an access point (AP) using multi hop wireless routes via other mobile hosts. Hybrid wireless networks facilitate the effective and efficient integration of a mobile Wireless Ad Hoc Network (MANET). The wireless infrastructure has proved a better alternative next generation wireless networks. By directly adopting resource reservation based QOS routing for MANET in a hybrid network Inherit invalid reservation and race condition problems in MANET.QOS transforms the packet routing problem to a resource scheduling problem QOS incorporates five routing algorithm, 1) QOS guaranteed neighbor selection algorithm to meet transmission delay requirement,2) A distributed packet scheduling algorithm reduce the further transmission delay, 3) A mobility based segment resizing algorithm that adaptively adjusts segment size,4) A traffic redundant elimination algorithm to increase transmission throughput and 5) A data redundancy based elimination algorithm top eliminate the redundant data to further improve the transmission QOS. QOS provide high performance in terms of overhead, transmission delay Mobile resilience and scalability.**

Keywords— Hybrid Wireless Networks, MANET, Routing Protocols, QOS.

I. INTRODUCTION

A. Wireless Network

Wireless is a more modern alternative to traditional wired networking that relies on cables to connect networkable devices together. Wireless technologies are widely used in both home and business computer networks. Wireless networks have been developed with various wireless applications, which have been used in areas of commerce, emergency, services, military, education and entertainment. The rapid improvement of Wi-Fi capable mobile devices including laptops and handheld devices, for example the purpose of wireless internet users of smart phone in last three years. The usage of people watching video, playing games and making long distance video or audio conferencing through wireless mobile devices and video streaming applications on infrastructure wireless networks which connects directly to mobile users for video playing and interaction in real time are increased . The evolution and the anticipate future of real time mobile multimedia streaming services are extensively expanded, so the networks are in need of high Quality of Service(QoS) to support wireless and mobile networking environment.

B. Hybrid Wireless Network

A hybrid wireless network is an extension to an infrastructure network, where a mobile host may connect to an access point (AP) using multi hop wireless routes via other mobile hosts. The APs are configured to operate on one of multiple available channels. Mobile hosts and wireless routers can select their operating channels dynamically through channel switching. Hybrid wireless networks (i.e., multihop cellular networks) have been proven to be a better network structure for the next generation wireless networks. It can help to tackle the stringent end-to end QoS requirements of different applications. Hybrid networks synergistically combine infrastructure networks and MANETs to leverage each other. For example it integrates a mobile Wireless Ad Hoc Network (MANET) and wireless infrastructure has proved a better alternative next generation wireless networks.

C. Quality of service (QoS)

It is the overall performance of a computer network, particularly the performance seen by the users of the network. To quantitatively measure quality of service, several related aspects of the network service are often considered, such as error rates, bandwidth, throughput, transmission delay, availability, jitter, etc. Quality of service is particularly important for the transport of traffic with special requirements. In particular, much technology has been developed to allow computer networks to become as useful as telephone networks for audio conversations, as well as supporting new applications with even stricter service demands. QOS provide high performance in terms of overhead, transmission delay Mobile resilience and scalability. Hybrid wireless network has proved a better network structure for next generation of wireless networks and help to tackle the stringent end to end QOS requirement for different applications.

II. OBJECTIVE OF THE PROJECT

The significant intention of this project is to guarantee the QoS requirement in hybrid wireless networks. The proposed QoS-Oriented Distributed routing protocol (QOD) to enhance the QoS support capability of hybrid networks. Taking advantage of fewer transmission hops and any cast transmission features of the hybrid networks, QOD transforms the packet routing problem to a resource scheduling problem. Analytical and simulation results based on the random way-point model and the real human mobility model show that QOD can provide high QoS performance in terms of overhead, transmission delay, mobility-resilience, and scalability.

III. RELATED WORKS

A. Routing protocols

The routing protocol is a convention, or standard, that controls how nodes decide which way to route packets between computing devices in a network. In networks, nodes are not familiar with the topology of their networks. Instead, they have to discover it: typically, a new node announces its presence and listens for announcements broadcast by its neighbors. Each node learns about others nearby and how to reach them, and may announce that it too can reach them. The following is a list of routing protocols.

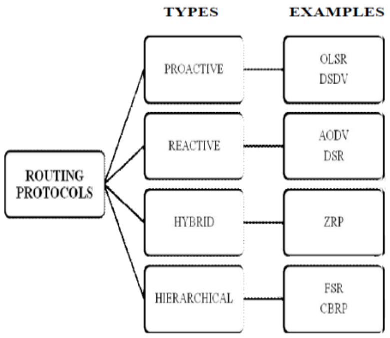

Fig.1 Classification of Routing Protocols

Proactive routing

It is called as Table-driven Routing. This type of protocols maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the network.

The main disadvantages of such algorithms are:

1. Respective amount of data for maintenance.
2. Slow reaction on restructuring and failures.

Examples of proactive algorithms are:

- Optimized Link State Routing Protocol (OLSR)
- Optimized Link State Routing Protocol RFC 3626.
- Babel RFC 6126
- Destination Sequence Distance Vector (DSDV)

Reactive routing

It is called as On-demand Routing. This type of protocols finds a route on demand by flooding the network with Route Request packets. The main disadvantages of such algorithms are:

1. High latency time in route finding.
2. Excessive flooding can lead to network clogging.

Examples of on-demand algorithms are:

- Ad hoc On-demand Distance Vector(AODV) (RFC 3561)
- Dynamic Source Routing (RFC 4728)
- Flow State in the Dynamic Source Routing
- Power-Aware DSR-based

Hybrid routing

This type of protocol combines the advantages of proactive and reactive routing. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. The choice of one or the other method requires predetermination for typical cases.

The main disadvantages of such algorithms are:

1. Advantage depends on number of other nodes activated.
2. Reaction to traffic demand depends on gradient of traffic volume.

Examples of hybrid algorithms are:

- ZRP (Zone Routing Protocol) ZRP uses IARP as pro-active and IERP as reactive component.

Hierarchical routing protocols

With this type of protocol the choice of proactive and of reactive routing depends on the hierarchic level in which a node resides. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding on the lower levels. The choice for one or the other method requires proper attributation for respective levels. The main disadvantages of such algorithms are:

1. Advantage depends on depth of nesting and addressing scheme.
2. Reaction to traffic demand depends on meshing parameters.
Examples of hierarchical routing algorithms are:

- CBRP (Cluster Based Routing Protocol)
- FSR (Fisheye State Routing protocol)

Need for QoS Routing

The Quality of Service (QoS) based routing is defined as a "*Routing mechanism under which paths for flows are determined based on some knowledge of resource availability in the network as well as the QoS requirement of flows*."
The main objectives of QoS based routing are:
The goal of QoS routing algorithms is to find a path in the network that satisfies the given quality requirements. Dynamic determination of feasible paths for accommodating the QoS of the given flow under policy constraints such as path cost, provider selection etc,Optimal utilization of resources for improving total network throughput and graceful performance degradation during overload conditions giving better throughput. QoS routing should rapidly find a feasible new route to recover the service.

IV. EXISTING SYSTEM

A. INTRODUCTION

Hybrid wireless networks (i.e., multi hop cellular networks) have been proven to be a better network structure for the next generation wireless networks and can help to tackle the stringent end-to end QoS requirements of different applications. Hybrid networks synergistically combine infrastructure networks and MANETs to leverage each other. Specifically, infrastructure networks improve the scalability of MANETs, while MANETs automatically establish self-organizing networks, extending the coverage of the infrastructure networks. In a vehicle opportunistic access network (an instance of hybrid networks), people in vehicles need to upload or download videos from remote Internet servers through access points (APs) (i.e., base stations) spreading out in a city. Since it is unlikely that the base stations cover the entire city to maintain sufficiently strong signal everywhere to support an application requiring high link rates, the vehicles themselves can form a MANET to extend the coverage of the base stations, providing continuous network connections.

Disadvantages

How to guarantee the QoS in hybrid wireless networks with high mobility and fluctuating bandwidth still remains an open question. In the infrastructure wireless networks, QoS provision has been proposed for QoS routing, which often requires node negotiation, admission control, resource reservation, and priority scheduling of packets. However, it is more difficult to guarantee QoS in MANETs due to their unique features including user mobility, channel variance errors, and limited bandwidth. Thus, attempts to directly adapt the QoS solutions for infrastructure networks to MANETs generally do not have great success. By directly adopting resource reservation-based QoS routing for MANETs, hybrids networks inherit invalid reservation and race condition problems in MANETs. Invalid reservation problem means that the reserved resources become useless if the data transmission path between a source node and a destination node breaks. Race condition problem means a double allocation of the same resource to two different QoS paths.

B. SYSTEM ARCHITECTURE

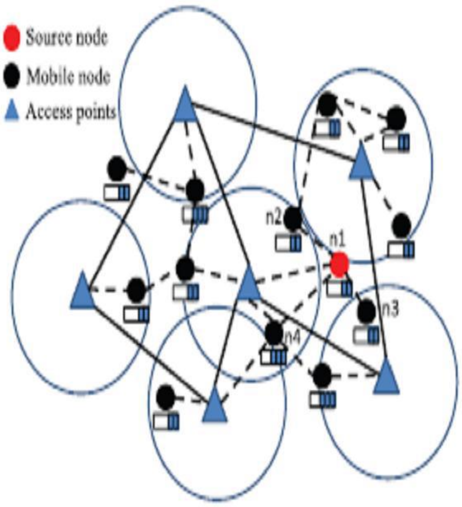

Fig.2 Model architecture for Hybrid Wireless Network

Fig.2 exemplifies the network model of a hybrid network. For example, when a source node n1 wants to upload files to an Internet server through APs, it can choose to send packets to the APs directly by itself or require its neighbor nodes n2, n3,or n4 to assist the packet transmission. We assume that queuing occurs only at the output ports of the mobile nodes. After a mobile node generates the packets, it first tries to transmit the packets to its nearby APs that can guarantee the QoS requirements. If it fails (e.g., out of the transmission range of APs or in a hot/dead spot), it relies on its neighbors that can guarantee the QoS requirements for relaying packets to APs. Relaying for a packet stream can be modeled as a process, in which packets from a source node traverse a number of queuing servers to some APs.In order to enhance the QoS support capability of hybrid networks, in this paper, we propose a QoS-Oriented Distributed routing protocol (QOD). Usually, a hybrid network has widespread base stations. The data transmission in hybrid networks has two features. First, an AP can be a source or a destination to any mobile node. Second, the number of transmission hops between a mobile node and an AP is small. The first feature allows a stream to have any cast transmission along multiple transmission paths to its destination through base stations, and the second feature enables a source node to connect to an AP through an intermediate node.

V. SYSTEM MODULES

1. Mobile ad-hoc network creation and Routing

In this module, a Hybrid network is created. All the nodes are configured and randomly deployed in the network area. Since our network is a wireless network, nodes are assigned with mobility (movement). A routing protocol AODV is implemented in the network. Sender and receiver nodes are randomly selected and the communication is initiated between the nodes using CBR agent.

2. QoS Analysis in hybrid Networks

In this module, the performance of the hybrid network and QoS parametersare analyzed. Based on the analyzed results X-graphs are plotted. Throughput, delay, energy consumption are the basic parameters considered here and X-graphs are plotted for these parameters.

3. Implementation of QoS technique

In this module, QoS algorithm is implemented. The source node schedules the packet streams to neighbors based on their queuing condition, channel condition, and mobility, aiming to reduce transmission time and increase network capacity. The neighbors then forward packets to base stations, which further forward packets to the destination. CSMA/CA is implemented for scheduling and collision avoidance.

4. **Performance analysis and Result Comparison, Conclusion**

In this module, the performance of the proposed method is analyzed. Based on the analyzed results X-graphs are plotted. Throughput, delay, energy consumption are the basic parameters considered here and X-graphs are plotted for these parameters.

Finally, the results obtained from this module is compared with previous results and comparison X-graphs are plotted. Form the comparison result, final RESULT is concluded.

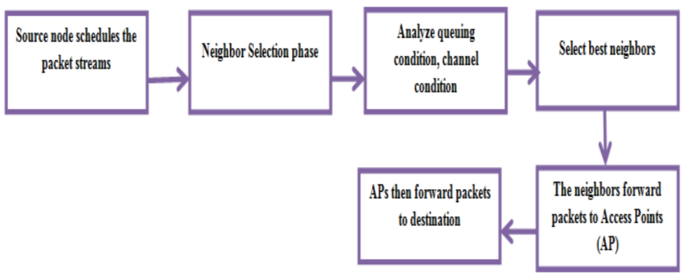

Fig.3 Block Diagram for Proposed System

IV. RESULT ANALYSIS

We use NS2 as our simulating tool. We assigned a network consisting of 40 nodes from node 0 to node 39.Initially, each node find its neighbor node by transmitting HELLO Messages. The HELLO Messages is transmitted periodically for every HELLO period second. The default transmitting range for HELLO Message is 250m. After finding its one hop and two hop neighborhoods, a node start transmitting its packet .The source node sends constant bit rate traffic to destination node. The traffic sources are carried by transport layer protocols User Datagram protocol (UDP) or Transmission control protocol (TCP). At the end of simulation, the trace file is created and the NAM is running (since it is invoked from within the procedure finish{}).Trace file gives the details of packet flow during the simulation.NAM trace is records simulation detail in a text file, and uses the text file the play back the simulation using animation.

Here we are assigning 40 nodes from node 0 to node 39 and they are apart from each other.

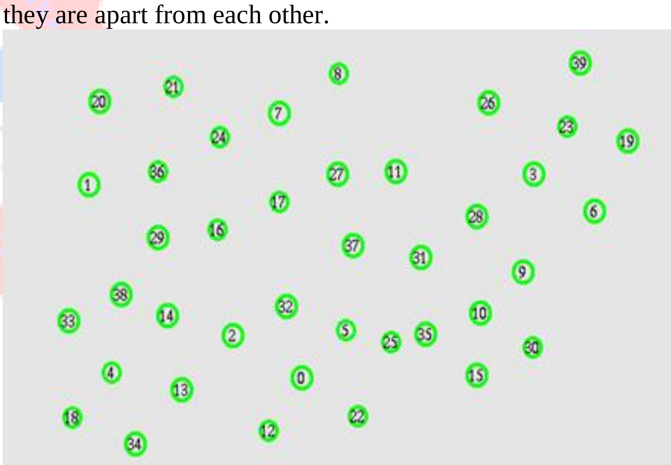

Fig.4 Node Initialization

All the nodes configured here and access points are highlighted during this stage.

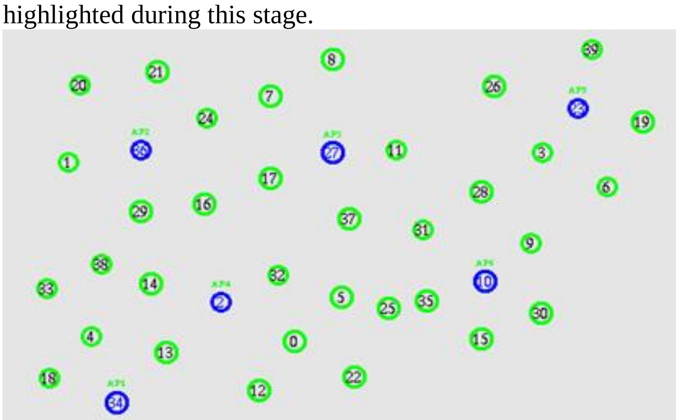

Fig.5 Neighborhood Identification & Node Configuration

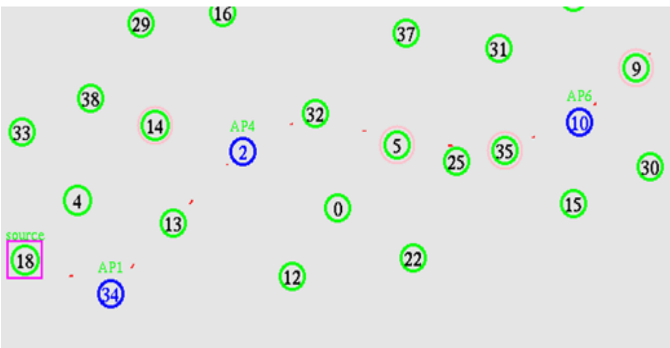

Fig.6 Communication through APs

In the figure communication has started through the APs.

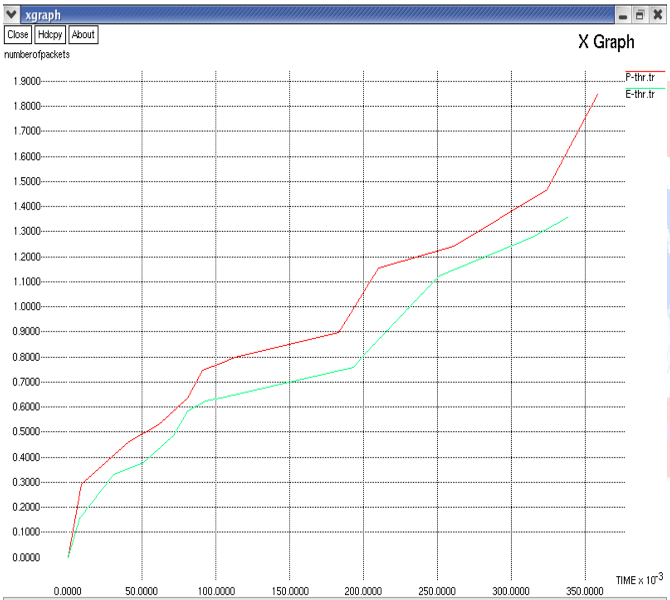

Fig.7 Xgraph for throughput

The graph in Figure 7 shows the throughput comparison and it's high for proposed system.

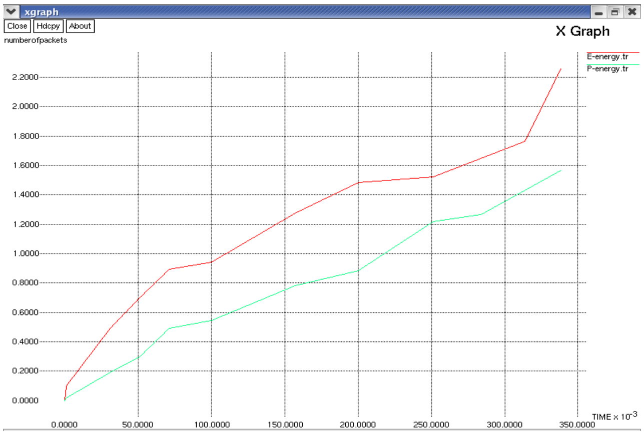

Fig.8 Xgraph for Energy Consumption

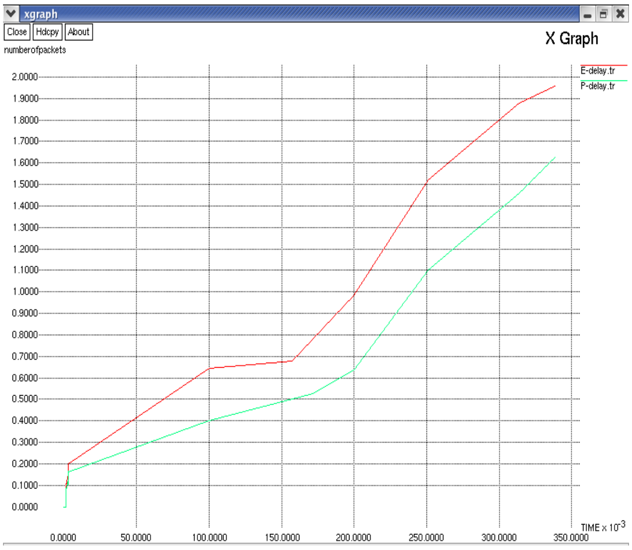

Fig.9 Xgraph for Delay

V. CONCLUSION

Hybrid wireless networks that integrate MANETs and infrastructure wireless networks have proven to be a better network structure for the next generation networks. However, little effort has been devoted to supporting QoS routing in hybrid networks. Direct adoption of the QoS routing techniques in MANETs into hybrid networks inherits their drawbacks. In this paper, we propose a QoS oriented distributed routing protocol (QOD) for hybrid networks to provide QoS services in a highly dynamic scenario. Taking advantage of the unique features of hybrid networks, i.e. anycast transmission and short transmission hops, QOD transforms the packet routing problem to a packet scheduling problem. In QOD, a source node directly transmits packets to an AP if the direct transmission can guarantee the QoS of the traffic. Otherwise, the source node schedules the packets to a number of qualified neighbor nodes. Specifically, QOD incorporates five algorithms. The QoS-guaranteed neighbor selection algorithm chooses qualified neighbors for packet forwarding. The distributed packet scheduling algorithm schedules the packet transmission to further reduce the packet transmission time. The mobility-based packet resizing algorithm resizes packets and assigns smaller packets to nodes with faster mobility to guarantee the routing QoS in a highly mobile environment. The traffic redundant elimination-based transmission algorithm can further increase the transmission throughput. The Soft-deadline-based forwarding scheduling achieves fairness in packet forwarding scheduling when some packets are not scheduling feasible. Experimental results show that QOD can achieve high mobility-resilience, scalability, and contention reduction.

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