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An Efficient Approach For Multimedia Transmission Using Multipath Routing In Manet

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ABSTRACT: Mobile Ad hoc Networks community provides us with a wealth of technologies that enable the source and the destination nodes to route the data through a number of intermediate forwarding nodes. Fast resources discovery and high Quality of Service are key determinants for efficient multimedia transmission. In this paper, we describe a technique of Multipath Routing using AOMDV routing protocol used for multicasting multimedia data transmission in MANET. Multi-path routing represents a routing method for wireless mobile ad hoc networks. Multi-path routing achieves load balancing and is more resilient to route failures. Ad Hoc On-demand Multipath Distance Vector protocol is used to choose the multiple paths available for multicasting multimedia data in MANET, based on the rate-distortion metric instead of finding the disjoint paths. The multimedia data further transferred to one and two hop neighbours. The ability of creating multiple routes from the source to a destination is used to provide backup route. When primary route fails to deliver the packets in some way, the backup is used for maintaining connection establishment. Multipath routing using AOMDV achieves lower average end-to-end delay, high video data delivery, lower routing overhead and packet loss rate, higher network throughput, quality of service in comparison with single hop neighbours.

KEY WORDS: Multimedia, Multicasting, AOMDV, MANET

I. INTRODUCTION

A mobile ad-hoc network (MANET) is a collection of mobile nodes which does not rely on any infrastructure for communication [1]. Routing is the process of selecting paths in a network to forward the data packets. Proactive routing maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the networks. Reactive routing protocol finds a route on demand by flooding the network with route request packets. Changqiao Xu et.al, [3] proposed a CMT-QA (quality-aware adaptive concurrent multipath transfer) solution for SCTP (Stream Control Transmission Protocol)-based data delivery over heterogeneous wireless networks. CMT-QA relies on three mechanisms: the path quality estimation model (PQEM), data distribution scheduler (DSS) and optimal retransmission (ORP) algorithm. PQEM chooses a reasonable estimation interval to calculate the data handling rate of entering and leaving sender buffer for each path, which describes any path's communication quality. DDS chooses a subset of suitable paths for load sharing and dynamically assigns them appropriate data flows. ORP upgrades the basic CMT retransmission policies to improve packet retransmission efficiency. Danqi Wang.et.al [4] have proposed Superchunk-Based Efficient Search in P2P-VoD System. One of the most extensively discussed proposals in P2P is the tree-based approach. In such an approach, peers are organized into a tree structure for delivering data, with each data packet being disseminated using the same structure. Nodes in the structure have well-defined relationships-"parent-child" as encountered in trees. A tree-based solution called SURFNet used for P2P Video on Demand services. SURFNet is a content discovery mechanism designed for P2P-Video on Demand system, aiming to minimize seeking buffering delay.

Hanan Luss [5] have proposed Optimal Content Distribution in Video-on-Demand Tree Networks. A model that allows this flexibility would reduce the overall costs while satisfying different demands at different nodes of the network. The model is solved by a multistate Dynamic programming algorithm. The algorithm generalizes single-state algorithms used to solve simpler models for installing equipment in a tree network (e.g., DSL multiplexers or optical network units). Dynamic Programming that installs servers at a subset of the nodes with some or all programs at each of these servers. Tianyin Xu et.al [7] have proposed Supporting VCR-like Operations in Derivative Tree-Based P2P

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Streaming Systems for an interactive streaming system to provide continuous media streaming with VCR-like user interactivity in large-scale P2P network. The Derivative Tree Stream system mainly used with media servers, sessions and a Session Circles. Media servers simply provide media streaming service. Cooperative communication has received tremendous interests in wireless networks. Quansheng Guan et.al [1] have proposed Topology Control in Mobile Ad Hoc Networks with Cooperative Communications to improve the network capacity in MANETs by jointly considering both upper layer network capacity and physical layer cooperative communications. Cooperative communication typically refers to a system where users share and coordinate their resources to enhance the information transmission quality. Two constraint conditions need to be taken into consideration in the COCO topology control scheme. One is network connectivity, which is the basic requirement in topology control. The other aspect that determines network capacity is the path length.

W.-P.Ken Yiu et.al [9] have proposed VMesh: Distributed Segment Storage for Peer-to-Peer Interactive Video Streaming which efficiently supports random seeking functionality. Provisioning random access functions in peer-to-peer on-demand video streaming is challenging, due to not only the asynchronous user interactivity but also the unpredictability of group dynamics. In VMesh, videos are divided into segments and stored at peers' local storage in a distributed manner. VMesh utilizes distributed hash table to locate these segments. DHT is a structured overlay constructed among peers. Che-Liang Liu et.al [10] have proposed Cross-Layer Mobile Chord P2P Protocol Design for VANET to provide scalable content distribution in vehicular networks, Chord peer-to-peer overlay could be applied. Most P2P protocols, including Chord, are de-signed for wired-line network, and might perform poorly in mobile networks. Mobile Chord is proposed to enhance the P2P performance over Vehicular Ad Hoc Network. The design mechanisms of Mobile Chord to reduce protocol overhead in Mobile Chord as P2P protocol and the frequent topological change are, Aggressive table update try to use any available information to update finger table and over-lay table for Mobile Chord.

Hyung Rai Oh et.al [11] have proposed an Effective Mesh-Pull-Based P2P Video Streaming System Using Fountain Codes with Variable Symbol Sizes for video-on-demand services. P2P video streaming is composed of a peer selection mechanism to guarantee seamless playback, a feedback- based Fountain encoding mechanism to determine the size of Fountain codes in order to minimize computational complexity with a short initial latency. In addition, the Fountain code symbol size is continuously adjusted to minimize additional computational overhead required for Fountain encoding/decoding P2P streaming. Ana Paula Couto da Silva et.al [12] have proposed Chunk Distribution in Mesh-Based Large-Scale P2P Streaming Systems: A Fluid Approach for different design choices adopted while building the overlay topology may have on the system performance. Fluid models allows to comparing the performance of different strategies providing guidance for the design of new and more efficient systems. Wang.S.et.al [13] have proposed a Qos Aware Routing Metric Based on Bandwidth for Wireless Networks that incorporates an admission control scheme and a feedback scheme to meet the Quality of Service requirements of real-time applications. The novel part of this Quality of Service aware routing protocol is the use of the approximate bandwidth estimation to react to network traffic. Multimedia streaming in Wireless Sensor Network is required for future military applications to provide high-quality information. E.P.C Jones.et.al [2] have proposed Multicast Traffic Load Balancing Through Link Rate Diversity in Wireless Networks to obtain the available capacity at a mesh node for a multicast transmission and it is not just a function of the aggregate pre-existing traffic load of other interfering nodes but intricately coupled to the actual (sender, receiver) set and the link-layer rate of each individual transmission.

Changqiao et.al [14] have proposed QoE-driven User-Centric VoD Services in Urban Multi-homed P2P-based Vehicular Networks for Video on Demand services in urban vehicular network environments. Quality of User Centric Video on Demand relies on a multi-homed hierarchical peer-to-peer and vehicular ad-hoc network architecture. A novel grouping-based storage strategy is proposed which distributes uniformly the video segments along the Chord overlay, reducing segment seeking traffic, while also enabling load-balancing. Changqiao Xu.et.al [6] have proposed Performance Evaluation of Multimedia Content Distribution over Multi-Homed Wireless Networks for a real-time multimedia transmission in SCTP Single Path Transfer scenarios in a tolerant of network failure manner. An optimum Stream Control Transmission Protocol configuration scheme for video transmissions analyzes the effect on end user perceived quality of utilizing various concurrent multipath transfer mechanisms during SCTP-based video delivery. Multicasting is fundamentally different from data communication, since interactive video applications are delay and loss sensitive C. Cordeiro [8] have proposed Multicast over Wireless Mobile Ad Hoc Networks. Due to the mobility of

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wireless nodes, the topology of ad hoc networks may change frequently. Each packet of an interactive video application has a strict delay constraint.

The remainder of this paper is organized as follows. Section II explains the proposed system of this paper. Section III discusses the results of proposed system. Section IV draws some conclusion. Finally, Section V discusses the future work.

II. PROPOSED SYSTEM

1. Framework of MANET

- A group of mobile, wireless nodes which cooperatively and spontaneously form a network independent of any fixed infrastructure or centralized administration.
- A node communicates directly with nodes within wireless range and indirectly with all other destinations using a dynamically determined multi-hop route though other nodes in the MANET.
- Self- creating is not relying on a preexisting fixed infrastructure. Self- organizing is not predetermined topology.

Multimedia transmission services in MANETs can be implemented using non-real-time downloads or real-time streaming. Download delivery in general does not relate to the usual timing constraints for media data. By using appropriate end-to-end protocols one could more easily deal with connectivity loss and longer outages in MANETs in order to provide full reliability.

2. Multipath routing Selection and Establishment for Multicasting Mobile Nodes

AOMDV protocol is used to choose the multiple paths available for multicasting data at multiple paths, based on the rate-distortion metric instead of finding the disjoint paths. Multipath agents are attached to the nodes for connection establishment and maintenance.

2.1 Route request of nodes using Multipath Routing

The AOMDV Routing Protocol uses an on-demand approach for finding routes, that is, a route is established only when it is required by a source node for transmitting multimedia data packets. It employs destination sequence numbers to identify the most recent path. A Route Request carries the Source Identifier, the Destination Identifier, the Source Sequence Number, the Destination Sequence Number, the Broadcast Identifier and the Time To Live field. DestSeqNum indicates the freshness of the route that is accepted by the source. When an intermediate node receives a Route Request, it either forwards it or prepares a Route Reply if it has a valid route to the destination.

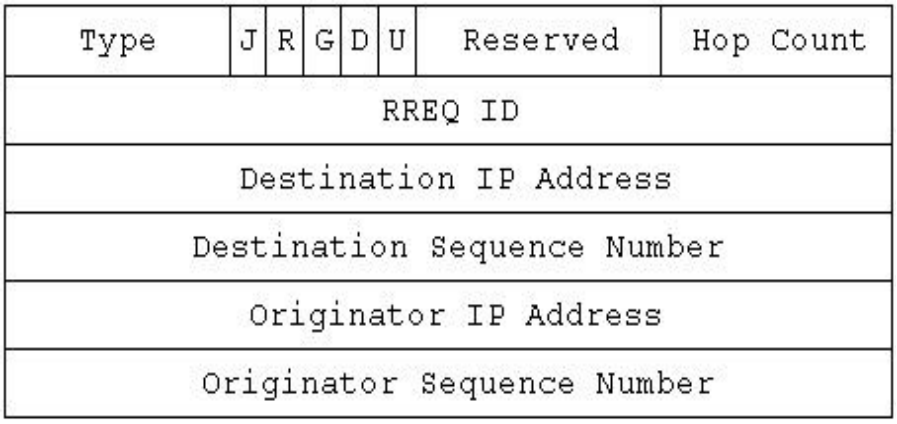

Figure1. Format of Route Request Packet

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2.2 Route Discovery

When a source node wants to communicate with a destination node, it checks its route table to confirm whether it has a valid route to the destination. If so, it sends the packet to the appropriate next hop towards the destination. However, if the node does not have a valid route to the destination, it must initiate a route discovery process. To begin such a process, the source creates a RREQ packet. This packet contains message type, source address, current sequence number of source, destination address, the broadcast ID and route path.

3. Multicasting Scheme of Video Nodes using Multipath Routing

Routing of data packets can be either unicast or multicast transmission. Unicast transmission, in which a packet is sent from a single source to a specified destination. Multicasting is the networking technique of delivering the same packet simultaneously to a multiple nodes or group of nodes. Multipath routing using AOMDV is used to obtain a multicasting of nodes through multiple paths.

3.1 Partial Video Sequence (PVS) Caching Scheme

Partial Video Sequence decomposes video sequences into a number of parts by using a scalable video compression algorithm. Video parts are selected to be cached in local video servers based on the amount of bandwidth that would be demanded from the distribution network and central video server if it was only kept in the central video server.

3.2 Prefix Caching

Prefix Caching could reduce the request rejection ratio and client waiting time. The network bandwidth usage also has been reduced by the caching scheme through sharing the video data of the currently played video object with other clients of the active chain.

3.3 Neighbour Based Caching Scheme

Mobile client can download the first segment of the video from the initial buffer of the neighbour client to its own initial buffer. The mobile client must be within the coverage area of neighbour client.

4. Distortion Estimation of Video Nodes for Throughput Capacity

A metric used for estimating video nodes is *rate-distortion*, instead of conventional network performance metrics (i.e. hop-count, loss probability, and delay) for video routing. The rate distortion is estimated by using the network prediction models. In our model, packet loss is generated by two reasons: channel error and queuing loss.
The steps to estimate the video distortion introduced by a node:

- First, packet error probability in the MAC layer is estimated
- Second, packet loss probability due to congestion is estimated
- Third, rate distortion model is used to calculate the rate-distortion of a node

5. Topology Construction

Topology construction involves determining where to place the components and how to connect them. The topology of the network is dependent on the relative locations and connections of nodes within the network. The (topological) optimization methods that can be used in this stage come from an area of mathematics called Graph Theory. These methods involve determining the costs of transmission and the cost of switching.

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III. SIMULATION RESULTS

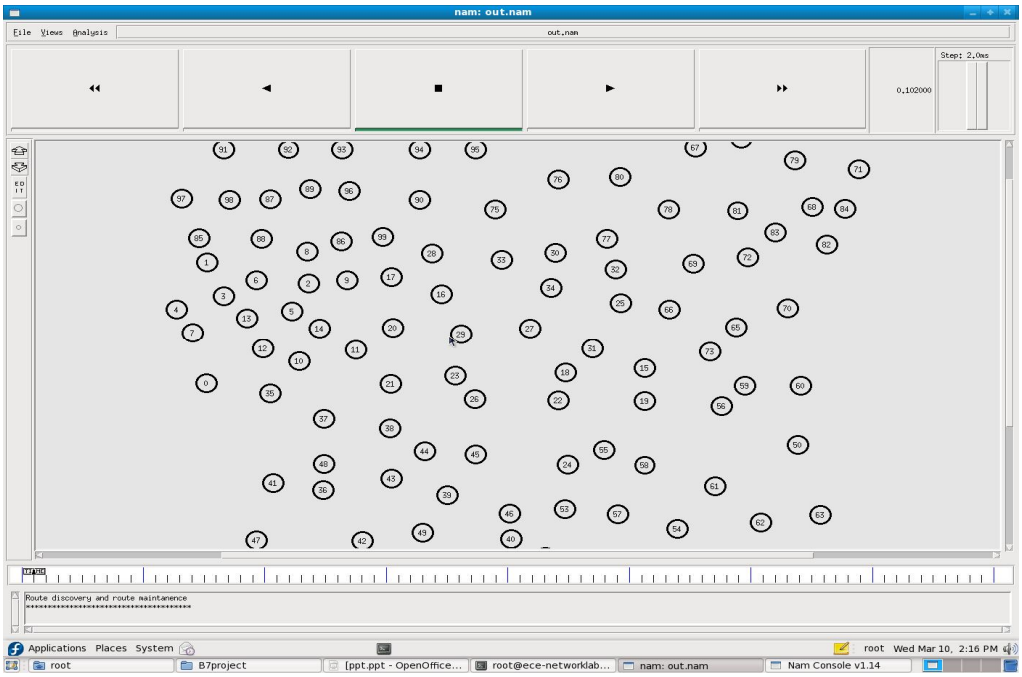

Figure 2. Initial Position of Nodes

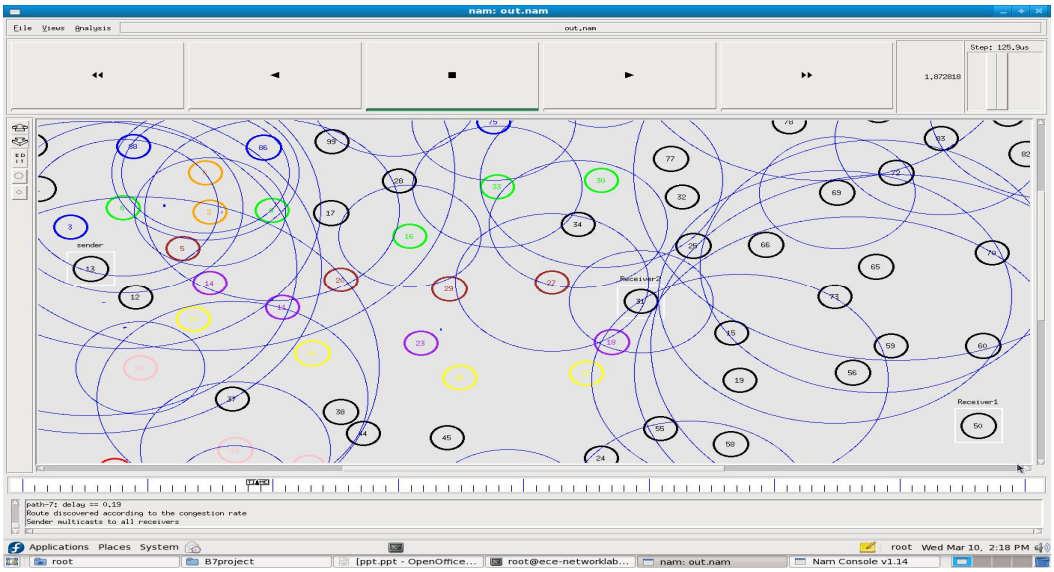

Figure 3. Multicasting of Data Packets

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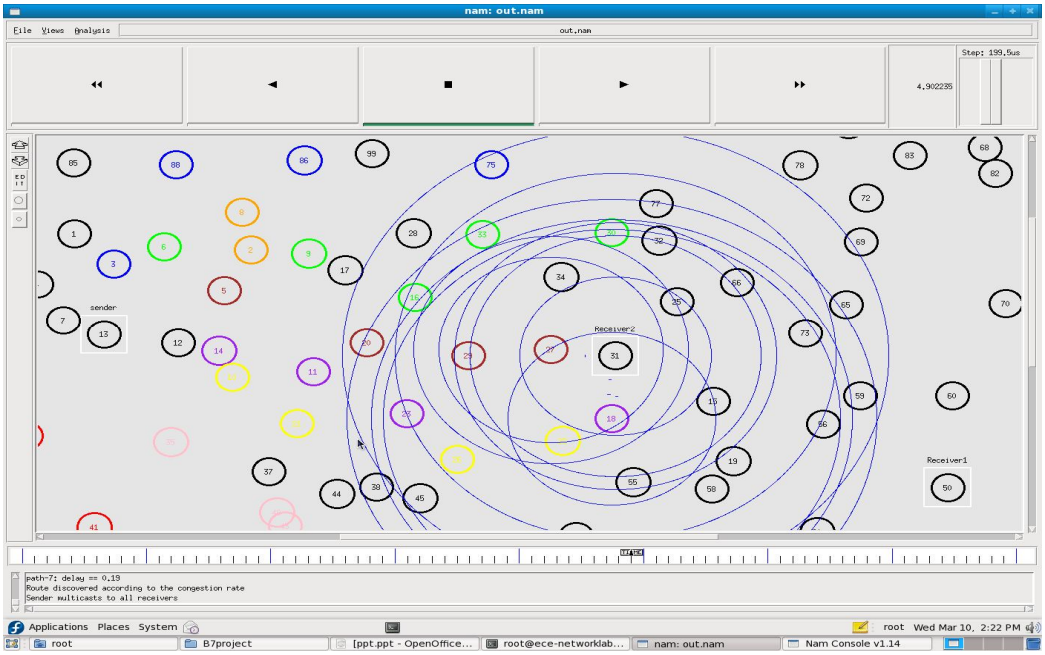

Figure 4. Data received at multiple nodes

IV. CONCLUSION

In this paper, the problem of real-time video multipath multicasting communication over wireless ad hoc networks has been analyzed. The proposed technique Adhoc On-demand Multipath Distance Vector Protocol used to choose the multiple paths available, based on the rate-distortion metric instead of finding the disjoint paths. The multimedia packets are multicasting using multiple paths and further transferred to neighbours. Route Selection includes the process of route discovery and initiates the process of incoming multimedia text. Route maintenance is done by means of route error packets and it is obtained based on disortion estimate and the multimedia data are received at multiple nodes. By making use of Multipath Routing using AOMDV ensures the efficient video delivery between mobile nodes achieves high packet rate delivery, lower routing overhead and improve throughput.

V. FUTURE ENHANCEMENT

In future enhancement, the infrastructure, ad hoc configurations and the factors such as overhead, security and reliability will be considered for multipath routing using AOMDV for multimedia transmission. The other parameters such as jitter and bandwidth can also be taken to improve the performance even better. This multipath video multicasting adopting AOMDV protocol would be highly efficient when applied for applications that run on real time such as teleconferencing, video streaming and optimizing AOMDV for high speed mobility networks.

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