Review Paper on Comparative Performance analysis of MANET Routing Protocols for Real Time Multimedia Applications

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***Abstract*— Mobile Ad Hoc Network is a collection of wireless nodes communicating with each other without any wired infrastructure. This is very popular domain of research due to their ad hoc nature. Multiple network hops are required to deliver and exchange data across a network. Ad-hoc networks have been an object of interest not just because of the prospects they offer but also because of the numerous issues that they face. One such issue is the distribution of high bandwidth real-time data via multicasting. This paper is review on performance of routing protocols like PUMA and OLSR for multicasting multimedia data content on multi-hop Ad-Hoc network.**

***Index Terms*— MANET, Multicasting, real time data, OLSR, PUMA, Multi-Hop**

I. INTRODUCTION

Multimedia applications like video streaming are experiencing fast growth and demand for diverse business needs. Applications of video streaming include, for example, commercial applications such as e-learning, video conferencing, stored-video streaming; and military applications such as video surveillance of targeted field or specific objects. Video traffic is resource intensive and consumes a lot of network bandwidth; therefore it is challenging issue to stream video over limited-bandwidth networks, for example, WSN. In many cases, bandwidth usage implies direct cost on end-users. In this paper, we try to focus on performance analysis of routing protocols for multicasting real time video over multi-hop Ad-Hoc network.

Real-time multimedia refers to applications in which multimedia data has to be delivered and rendered in real time; it can be broadly classified into interactive multimedia and streaming media. Multimedia is a term that describes multiple forms of information, including text, image, audio, video, animation, graphics etc. Continuous media such as animation, audio and video that are time-based are the best examples of it. i.e., representing its presentation time, each audio sample or video frame has a timestamp associated with it. It is very important to present Multimedia data in a continuous fashion, in accordance with their associated timestamp. For example, to give the viewers the illusion of smooth motion video is typically rendered at 30 frames per second. As a result, multimedia applications typically have the real-time constraint, i.e., media data has to be delivered and rendered in real time. [29]

A. BASIC PROBLEMS IN VIDEO STREAMING:-

First, most multimedia applications have stringent delay constraints, including real-time delivery. Audio and video data must be played back continuously at the rate they are sampled. If the data does not arrive in time, the playing back process will stop and the artifact can be easily picked up by human ears and eyes. Second, multimedia data stream is usually busty due to the dynamics of different segments of the media. For most multimedia applications, the receiver has a limited buffer. The busty data stream, if not smoothed, may overflow or underflow the application buffer. When data arrives too fast, the buffer will overflow and some data packets will be lost, resulting in poor quality. When data arrives too slowly, the buffer will underflow and the application will starve, causing the playing back process to freeze. [28]

Streaming media technology enables the real time or on demand distribution of audio, video and multimedia on the Internet. Streaming media is the simultaneous transfer of digital media so that it is received as a continuous real-time stream. Streamed data is transmitted by a server application and received and rendered in real-time by client applications. These client applications can start playing back audio and video as soon as enough data has been received and stored in the receiver's buffer. There could be up to a few seconds of startup delay, i.e., the delay between when the server starts streaming the data and when the client starts the playback.

Techniques adopted by infrastructure networks like Wi-Fi or mobile cellular network are not even suitable for MANETs. Therefore Supporting real time video in MANET is complex task.. Also due to inherent broadcast capability, MANET is well suited for multicast applications. To achieve the preliminary objectives, several routing protocols in the area of mobile ad hoc networks should be examined.

B. MULTICAST SYSTEM:-

Now coming to multicast system, Multicast is a bandwidth-conserving technology that reduces traffic by simultaneously delivering a single stream of information to thousands of recipients. Multicasting is group oriented technique. This technique is used in areas where one to many or many to one distribution is essential task. For supporting group communication applications, Multicast transmission is a more effective mechanism when compared to unicasting. And hence is an important aspect of future network development. Multicast is used in videoconferencing, corporate communications, distance learning, and distribution of software, stock quotes, and news in real time. [11]

Due to the broadcast nature of the medium and the limited capabilities of the transceivers, the performance of multicast technique is questionable. Hence, proposed system consist study of the performance of the multicast routing protocols for real-time content distribution in a multi hop Ad-hoc network.

II. LITERATURE REVIEW

There are many works focalized on performance analysis of multicast routing protocols over MANET. The most of those related works take in consideration only the best effort traffic. In proposed work, our basic contribution is the comparative performances analysis of MANET routing protocols for streaming multimedia applications like video.

Elizabeth M. Royer and Chai-KeongToh, written a Review of Current Routing Protocols for Ad Hoc Mobile Wireless Networks. In this article they provide descriptions of several routing schemes for Ad Hoc Mobile network. They also provide classification of these schemes according to routing strategies. They have made comparison between these two strategies and also highlighting their features and characteristics. And finally identified possible applications and challenges faced by Ad-Hoc wireless mobile network. [21]

Supporting real-time video on MANETs is a complex task. Since the video packets delivery effectiveness is highly dependent on the network's state. The methods adopted by cellular or Wi-Fi infrastructure networks are not even suitable for MANETs Hence, P. A. Chaparro, J. Alcober J. Monteiro suggested, new techniques to be adopted to offer acceptable QoS levels to video traffic. In this work authors propose DACME-SV, an extension to the DACME architecture supporting scalable video transmission over MANET environments. [14]

Also as per Thomas Schierl, Thomas Stock hammer, and et al described in Mobile Video Transmission Using Scalable Video Coding, they describe potential use of SVC in mobile networks. Further they describe use causes of mobile media delivery. Also shown the impact of SVC on existing media delivery services and techniques by giving examples. In short they conclude SVC provides significant opportunities for network integration. [17]

As per Prof. Jintana Nakasuwan and Paitoon Rakluea, written in performance comparision of AODV & OLSR for mobile Ad Hoc network.Though MANET routing protocols have been studied through simulation. They perform extensive simulations on NS2. Since, AODV is reactive protocol and hence it generally involves greater latency if route is not known already. Their Studies have shown that AODV outperforms better OLSR in terms of average throughput. [12]

According to Performance of Ad hoc Network Routing Protocols in IEEE 802.11, written by Prof. Dr. Chandra Shekar Reddy Putta and et al proposed, multiple types of communication services (data, voice, and image) are supported by wireless technology which is based on the IEEE 802.11 standards with different QoS requirements. The aspect they study based on OLSR, AODV and DSR. They have considered qualitative and quantitative criteria. They perform analysis on end-to-end data delay, packet delivery ratio, routing load. They have noticed OLSR offers better performance for voice but it consumes more bandwidth. For 10 of connections PDR is about 53% and 80% for 60 connections. In DSR and AODV load delivery is quite similar. [13]

Swarna Parvathi.S and K.S.Easwarakumar proposed multicasting of scalable video streams over WiMAX networks. Multicast routing protocol PUMA is used to achieve scalability in the network. In this they encode the video using Scalable Video Coding and streamed through the multicast WiMAX network. And through simulations the have analyzed PSNR. They also concluded that SVC out performs better in WiMAX networks than WLAN. [7]

According to S Sumathy and et al Analysis of Multicast Routing Protocols: Puma and ODMRP, proposed MANET is an autonomous system of wireless mobile hosts, that dynamically create a temporary network connected by wireless links and creates an infrastructure less network. The topology of the network may change. This paper presents the comparative analysis of two multicast routing protocols, AODV, PUMA and ODMRP. According to the performance results between AODV, PUMA and ODMR, for group communications, multicast routing increases the efficiency and they conclude that more suitable protocol for video is PUMA. [8]

According to Routing protocols performance analysis for scalable video coding (SVC) transmission over mobile ad-hoc networks written by Olfa Ben Rhaiem and Lamia Chaari F ourati, providing quality of service and quality of experience to satisfy the consumer, is the main challenge of future wireless networks. Therefore, there is need of deeper investigations for video streaming over MANET. In this context, this article focused on performance analysis of routing protocol over MANET for scalable video streaming. In this work they use the spatial video coding (H.264/SVC) to encode video streams. And analyzed this video over

DSR, AODV, DSDV and TORA routing protocols algorithm. They have simulated and analyzed routing protocols by using different performance metrics. Also they studied the influence of mobile nodes number on performance of network. [4]

Tanya Koohpayeh Araghi and et al perform Performance Analysis in Reactive Routing Protocols in Wireless Mobile Ad Hoc Networks Using DSR, AODV and AOMDV. To find the best routing protocol based on the enforced conditions some reactive routing protocols are introduced in MANET and conclude with best routing protocol among them. They vary number of nodes up to 20 nodes, packet delivery ratio and throughput in DSR and AOMDV routing protocols are better than AODV while in checking end to end delay. [3]

Pratyush Manjul and et al. have studied the behavior of wireless multicasting of real time data in multi hop ad-hoc environment by making using of two routing protocols, namely OLSR and PUMA. They have presented a comparative study of multicasting of video and video-like data using two different Ad-hoc routing protocols, viz. OLSR and PUMA. NS2 simulations show that in all scenarios OLSR outperforms PUMA. [1]

Jogendra Kumar studied the performance of OLSR protocol in the paper named "Performance Analysis and Simulation of OLSR Routing Protocol in MANET," in this paper author simulate and implement OLSR routing protocol and checked the performance at 200 nodes. This paper concludes that OLSR protocol gives better performance in dense network due to proactive routing nature. [5]

According Rahul Desai and B P Patil in Analysis of Routing Protocols for Ad Hoc Networks, performed systematic analysis of MANET routing protocols namely AODV, OLSR, DSDV, DSR, AOMDV considering various mobility models i.e. RGMM, RWMM, RDMM and also different load conditions. They conclude that, for low load and low mobility DSDV and OLSR gives better results. AODV, DSR and AOMDV are more effective in high traffic diversity as well as high mobility. Also, Manhattan Mobility Model is usually selected as it gives highest packet delivery ratio and low control overhead as compared with Random Waypoint and Random group Mobility Models. [2]

T. Schierl and et al given approach to robust real time video transmission in MANET. In this approach for distribution of layered video they use forward error correction code in combination with SVC. And this combination is performed on OLSR protocol. Results conclude that the proposed system has advantages over single-server streaming approaches also proposed multisource streaming solutions. [16]

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