Approaches to improve Video Transmission over Wireless Network in MANET

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Abstract – Mobile network is one of the robust communication network on which different kind of data is communicated. The criticality and load of the network increases when some video data is communicated over the network. To perform the effective video communication a data fragment or multi path communication approaches are suggested by different researchers. In this paper, a study on different approaches of video data communication is presented. The paper has explored the concept of multi path communication along with data fragmentation in case of multimedia data transmission.

Keywords - Multi-media Communication, MANET, QOS, Multipath routing.

I. INTRODUCTION
Video transmission over wireless networks to multiple mobile users has remained a challenging problem due to potential limitations on bandwidth and the time-varying nature of wireless channels. Video transmission is one of the part in multimedia communication system. As we know that the multimedia has become an essential part of any presentation. The evolution of internet has also increased the demand for multimedia content. Multimedia is the media that uses multiple forms of information content and information processing (e.g. text, audio, video, graphics, animation, interactivity) to inform or entertain the user. Multimedia means that represented the computer information through audio, video, image, graphics and animation in addition to traditional media.[5] Video data separated into multiple streams and simultaneous transmission over multiple paths has to be beneficial for Mobile Ad-hoc Networks (MANET). It is possible to achieve higher aggregate data transmission rate while choosing several spatially distributed paths, thus benefiting from the spatial reuse of a wireless channel. That in its turn allows achieving higher video quality. Multiple paths have uncorrelated loss patterns that decrease the chance of video interruption. However, to fully exploit multi-path advantages one should evaluate network performance. It allows choosing appropriate multi-stream coding method, optimal number of streams, bitrates, frames and other parameters. Mobile ad hoc networks (MANETs) consist of multiple wireless mobile nodes which dynamically exchange data among themselves. MANET nodes are typically distinguished by their limited power, processing, and memory resources as well as high degree of mobility. The paper examines the issues of multipath routing in MANETs. [1] Multipath routing allows the establishment of multiple paths between a single source and single destination node. It is typically increase the reliability of data transmission or to provide load balancing. Streaming media may be either real time or on-demand. On demand streams are stored on the server and based on the user requirement content is transmitted. Then, user may play video or may download the video for viewing purpose. Real time stream are only available on a some particular time. For example, when the event is occurring and user can record the video. Video Communication may be point to point communication, multicast or broadcast. Video may be pre-encoded or may be encoded in real time.

A) Video on Demand
Recent advances in high speed network have facilitated the popularity of multimedia such as Video on Demand (VOD). Within the application field (e.g. movie on demand, distance learning, interactive news), these are expected to provide continuous media distribution to high number of client distributed geographically and with different access speed to the interconnection system. Video on Demand are simple in implementation but have obvious disadvantages. The limited capacities and lack of scalability make it difficult to provide acceptable service to all the client when number of user become large, which is very common on the internet. Distributed server architecture have been proposed in order to handle naturally distributed client more efficiently. Many research works have also be done for VOD services on
different networks, such as residential LANs, residential ASDL networks, CATV networks and the internet. This thesis study focus on design the architecture for VOD services, Bandwidth utilization on network.

II. MULTIPLE PATH VIDEO TRANSMISSION

A. MULTIMEDIA COMMUNICATION OVER WIRELESS NETWORK
Multimedia refers to the information/data being transferred over the network may be composed of one or more of the following types: Text, images, audio and video.

Multimedia divided into linear and non-linear categories. Linear active information/data content progresses without any navigation control for the viewer such as a cinema presentation. Non-linear information/data content offers user interactivity to control progress as used with a computer game or used in self-paced computer based training. Non-linear content is also known as hypermedia content.[5]

Multi-media communication also based on the quality of service for video transmission. The data transfer requirements are defined with different QoS parameters e.g., delay, jitter, error rate, capacity.

B. MOBILE AD-HOC NETWORK (MANET)
A Mobile Ad-hoc Network is a network in which independent mobile nodes can communicate to each other via radio waves. Each of the nodes have a wireless interface to communicate with each other. MANET networks are fully distributed, and can work at any place without the help of any fixed infrastructure as access points or base stations.

Fig.1 shows a simple ad-hoc network with 3 nodes. Node 1 and node 3 are not within range to each other. However the node 2 can be used to forward packets between node 1 and node 2. The node 2 will act as a router and these three nodes together form an ad-hoc network. MANET is collection of communication node that wishes to communicate with each other, but has no any fixed infrastructure and pre defined topology of wireless links. Every node is free to move anywhere, anyplace, anytime. Any node can join and leave in network. Mobility is core functionality in network. In network router perform task of routing. It is also different form of infrastructure for wireless network, in which special node known as an access point. An access point that manages communication among other nodes. In network topology can be dynamic and unpredictable.[2].

Fig. 1 MANET Network

C. MULTIPATH ROUTING
Multipath routing protocols in which routing protocols discover more than one route from source to destination. In wireless scenarios, routes are broken due to node movement. Therefore, multipath routing protocols are used to overcome the disadvantages of frequent broken of link protocol. Multipath routing protocols gives advantages of fault tolerance (by ensuring the availability of backup routes at all times). The use of back-up routes leads to less packet loss, makes communication sessions last longer and provides robustness to mobility and fading. All of these factors result in less energy consumption and there is the potential benefit that the lifetime of the network will be increased. Moreover, by dispatching the data packets of each flow through many network nodes along different paths, a better distribution of the traffic load may be achieved. Extending network lifetime energy related parameters are used.[3] It can used to provide load balancing, which reduces the congestion on a single path. Node-disjoint multipath routing help us to create multipath in the network in which there is no any node common other then source and destination. MANETs consist of mobile nodes that cause frequent link failures. This link failure causes two main problems. Firstly, when a route break occurs, all packets that have already been transmitted on that route are dropped and it decreasing the average packet delivery ratio (PDR). Secondly, the transmission of data traffic is halted for the time till a new route is discovered and it increasing the average end-to-end delay.

Path Diversity: Receiver can always receive some data during at any period of time, except when all the paths are down all together, which occurs very rarely, often than single path failures.

Load Balancing: Balance traffic load in higher number of nodes and links.

Fault Tolerance: By adding redundancy, to reduce the effect of network failure, it is important that the paths are disjoint. Multipath routing protocol offers multiple
paths with sufficient path diversity it is less probable that a link failure affecting one of the paths.

A. TECHNIQUE FOR VIDEO STREAMING

In this section, we survey existing techniques for video streaming over MANETs.

1. MULTIPLE DESCRIPTION CODING

Multiple Description Coding (MDC) has been proposed as source a coding technique that is robust to channel errors for video transmission. MDC encode a media source into two or more sub-bit streams. The sub-streams, also called descriptions have equal importance in the sense that each received description alone can guarantee a basic level of reconstruction quality and additional description can further improve the quality because the loss of one description does not influence other description, a lost packet in any path does not need to be retransmitted. Because each description has equal importance, MDC usually does not require prioritized transmission. Therefore, MDC is considered as a promising technique to enhance the Error flexibility of a video transport system by Transmitting the video over multiple independent Channels like MIMO[4,9]. Propose of multiple state video coding (MSVC) which is for high degree of correlation between the neighbouring pixels/lines/columns in a frame and the lost description can be recovered based on the correctly received ones. In MSVC, even if one description is completely lost, the other one can be independently decoded, and the reconstructed video can be rendered at half of the frame rate. It has also been suggested to recover lost frame in a damaged representation by utilizing temporally adjacent frame in another description, and use these recovered frames for future prediction. Ivana Radulovic et al in[7]propose MVSC-RP here they build on the popular MSVC scheme [6],and we propose to use redundant pictures (RP) in order to attenuate the error drift in case of loss. MSVC-RP scheme in terms of average PSNR, stability of reconstructed picture quality over time, and robustness to unknown network conditions. In MSVC-RP, it appears that at lower loss rates relatively small number of bits should be spent on redundant pictures (by using coarser quantization), while at high loss rates the redundant pictures should be almost as finely quantized as the primary ones. Mao et al. [8], an propose using MDC alone for streaming over MANETs is presented. This scheme is based on motion compensation such that for each frame n, it produces two predictions: one from the linear superposition of both previous frames n - 1 and n - 2 (central prediction), and one only from frame n - 2 (side prediction). From this, combining residuals from central and side predictions from even frames yields one description, while those for odd frames yields the other. Shiwen Mao et al. [10], proposed three MCP-based video transport techniques for mobile ad hoc networks. These schemes take advantage of path diversity to get better performance.

2. MULTIPATH ROUTING TECHNIQUE

Routing is responsible to establish and maintain one or more end-to-end paths from source to destination. The main issue in video streaming is concerning route of video streams is to recognize the routes that guarantee the video to be delivered with a satisfying perceptual quality. In general, Multipath routing can improve QoS by providing: (i) Accumulation of bandwidth and delay: breaking the capacity of more than one route. (ii) Route load balancing: balance the traffic load in higher number of nodes.(iii) Fault tolerance: by adding redundancy, to reduce the effect of network failures onto affected video quality, it is important that the paths are disjoint.

B. MULTIMEDIA OVER WIRELESS NETWORK

Ahmed et al. [11] worked on improving the quality of MPEG-4 transmission on wireless using Differentiated Services (Diffserv). They investigated QoS provisioning between MPEG-4 video application and Diffserv networks. To achieve the best possible QoS, all the components involved in the transmission process must collaborate. For example, the server must use stream properties to describe the QoS requirement for each stream to the network. They propose a solution by distinguishing the video data into important video data and less important video data (such as complementary raw data). Packets which are marked as less important are dropped in the first case if there is any congestion, so that the receiver can regenerate the video with the received important information.

Budagavi et al. [12] improved the performance of video over wireless channels by multiframe video coding. The multiframe coder uses the redundancy that exists across multiple frames in a typical video conferencing sequence so that additional compression can be achieved using their MF-BMC (Multi Frame - Block Motion Compensation) approach. They modelled the error propagation using the Markov chain, and concluded that use of multiple frames in motion increases the robustness. Their proposed MF-BMC scheme has been shown to be more robust on wireless networks when compared to the base-level H.263 codec which uses SF-BMC (Single Frame - BMC).

There are a number of studies, such as [13], [14], [15], [16], which concentrate on improving quality of multimedia over wireless networks. Since we are only interested in studies that focus on achieving multimedia video transmission, we do not go into
details of studies related to multimedia over wireless networks. Interested readers can use the references given above.

IV. CONCLUSION

Video transmission over MANET is challenging task. There exist so many protocols with different parameters. In this review paper concentrate on video transmission techniques and multipath routing protocol. In this paper different approaches of video streaming and transmission are discussed and explored.

REFERENCES


