International Journal of Computer Sciences
July’2016 Issue
ISSN Number: 4142 3453

Enhanced Mechanism for Controlling Distorition in Routing for Video Traffic in Wireless Networks

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Abstract*— Routing protocols designed for wireless networks since a long time are application specific. Here, we are working to reduce distortion in video traffic flowing over a wireless network. Today’s users demand high quality videos to be delivered seamlessly on their devices. In this paper, we discuss routing policies to reduce video distortion on an end to end basis. Typical routing algorithms designed for wireless network are application agnostic, so to overcome this we consider a wireless network where the application flows consists of video traffic. Reducing this distortion is critical for the user. Using link quality based routing metrics cannot minimize video distortion. So, we construct an analytical framework to understand first and then to assess the impact of wireless network on video distortion. Using this we can formulate a routing policy for minimizing distortion. We find via experiments that our protocol is efficient in reducing video distortion.

***Keywords*— Wireless network, Protocol, Distortion,Routing, AnalyticalFramework**

I.INTRODUCTION

Video traffic has become a problem nowadays due to the increase in the use of wireless networks. Maintaining a good quality of video is very important. The video quality is affected by: 1) the distortion due to compression at the source and 2) distortion due to both wireless channel induced errors and interference. Groups like I, P and Btype frames provide different levels of encoding. In I frame information is encoded independently, in P and B frames information is encoded relative to information encoded within other frame. Video quality can be improved by accounting for application requirements. The schemes used to encode a video clip can accommodate a certain number of packet losses per frame. If the number of lost packets exceeds a threshold value then the frame cannot be decoded correctly. Thus, resulting a distortion. The value of distortion depends on position of unrecoverablevideo frames in the GOP (Group of Pictures). So, we construct an analytical model to view the behaviour of the process that describes the evolution of frame losses in the GOP. Using this we capture how the choice of path for an end-to-end flow affect the performance of a flow in terms of video distortion. Our model is built based on a multilayer on approach as shown in fig1.The packet-loss probability on a link is mapped to the probability of a frame loss in the GOP and the frame loss probability is then directly associated with the video distortion

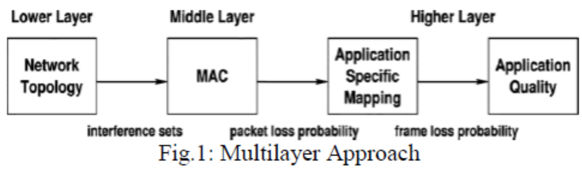

Fig.1: Multilayer Approach

Internet applications such as IPTV (Internet Protocol Television) and VOIP (Voice over Internet Protocol) which have high bit – rate multimedia content and high QOS (Quality of Service) are being delivered to users due to increase in bandwidths of broadband year after year. Providing broadband access is still a challenge in rural and mountainous regions because of technical and/or economic reasons due to which people living in such regions cannot benefit from the advantages offered by broadband access [1]. 802.11 WLANs have limited coverage and one-hop wireless networks such as 3G and licensed WiMAX are costly and usually require licences for channel. Multihop broadband wireless networks is a solution which provides broadband access along with much needed QoS [1]. Multihop wireless networks have one or many intermediate nodes which independently communicate among themselves along the route and send or receive packets using wireless links. Multihop networks can perform routing in a self-made manner, since they don't rely on any past framework base. Research interest has been increasing in wireless networks to deliver multimedia services as multimedia is expected to be a major traffic source over next – generation wireless networks [3]. Multimedia traffic is becoming very popular in wireless networks with the coming of smartphones. Transfer of video clips, pictures and voice data in areas of natural calamities, disaster recovery, drought hit areas, etc. to facilitate mission management by government agencies and NGO's has come as a hope to people in distress. Under such extreme scenarios maintaining a good quality of the video which is transferred is demanding from the user's prospect. The quality of video sent over wireless network is influenced by: 1) the use of compression techniques during which noise or distortion is added at the source and 2) both, errors entering in wireless channel and tampering also causes distortion in video [4]. Transmission losses can prevented by using different levels of encoding described in video encoding standards like MPEG-4 [7] or H.264/AVC [8]. I-type, P-type and Btype frames are groups of frame types which are defined in these encoding standards. In case of I-type frames data is encoded independently. In case of P-type and B-type frames encoding is performed based on the data encoded within other frames. Application-level performance of video transmissions can be derived using Group of Pictures (GoP) which allows for the matching of frame losses into a distortion metric [4]. Routing is the most often neglected critical functionality which affects the end-to-end video quality. There is a correlation between losses on the links that constitute routes from a source node to a destination node but most routing protocols which are designed for wireless multihop networks are application specific. Sometimes, few links can become heavily loaded with traffic which results in video distortion and while other links are less utilized as network traffic is independent. Network parameters and not application parameters are the only basis on which most of the routing protocols make their decisions to route the traffic [4].

II.RELATED WORK

1) Overview of the H.264/AVC video coding standard:

H.264/AVC is newest video coding standard of the ITU-T Video Coding Experts Group and the ISO/IEC Moving Picture Experts Group. The main goals of the H.264/AVC standardization effort have been enhanced compression performance and provision of a "network-friendly" video representation addressing "conversational" (video telephony) and "nonconversational" (storage, broadcast, or streaming) applications[1][2]. H.264/AVC has achieved a significant improvement in rate-distortion efficiency relative to existing standards. This article provides an overview of the technical features of H.264/AVC, describes profiles and applications for the standard, and outlines the history of the standardization process.

2)A high throughput path metric for multi-hop wireless routing:

This paper presents the expected transmission count metric (ETX), which finds high-throughput paths on multi-hop wireless networks. ETX minimizes the expected total number of packet transmissions (including retransmissions) required to successfully deliver a packet to the ultimate destination. The ETX metric incorporates the effects of link loss ratios, asymmetry in the loss ratios between the two directions of each link, and interference among the successive links of a path[3][4]. In contrast, the minimum hop-count metric chooses arbitrarily among the different paths of the same minimum length, regardless of the often large differences in throughput among those paths, and ignoring the possibility that a longer path might offer higher throughput.This paper describes the design and implementation of ETX as a metric for the DSDV and DSR routing protocols, as well as modifications to DSDV and DSR which allow them to use ETX. Measurements taken from a 29-node 802.11b test-bed demonstrate the poor performance of minimum hopcount, illustrate the causes of that poor performance, and confirm that ETX improves performance. For long paths the throughput improvement is often a factor of two or more, suggesting that ETX will become more useful as networks grow larger and paths become longer.

3) Packet loss resilient transmission of MPEG video over the internet

A method is proposed to protect MPEG video quality from packet loss for real-time transmission over the Internet. Because MPEG uses inter-frame coding, relatively small packet loss rates in IP transmission can dramatically reduce the quality of the received MPEG video. In the proposed high-priority protection (HiPP) method, the MPEG video stream is split into high- and low-priority partitions, using a technique similar to MPEG-2 data partitioning. Overhead resilient data for the MPEG video stream is created by applying forward error correction coding to only the high-priority portion of the video stream. The high- and low-priority data, and resilient data, are sent over a single channel, using a packetization method that maximizes resistance to burst losses, while minimizing delay and overhead. Because the proposed method has low delay and does not require re-transmission, it is well suited for interactive and multicast applications[5][6]. Simulations were performed comparing the improvement in video quality using the HiPP method, using experimental Internet packet loss traces with loss rates in the range of 0–8.5%. Overhead resiliency data rates of 0%, 12.5%, 25%, and 37.5% were studied, with different compositions of the overhead data for the 25% and 37.5% overhead rates, in an attempt to find the "best" composition of the overhead data. In the presence of packet loss, the received video quality, as measured by PSNR and the Negsob measure, was significantly improved when the HiPP method was applied [10][11].

III.PROPOSED SCHEME

In this paper, we discuss how video distortion experienced by the end user can be significantly reduced and the quality of video is improved by computing the application requirements. Certain number of packet losses per frame can be handled by different schemes used to encode a video clip. Any frame cannot be decoded if the lost packets in a frame exceed a certain threshold value. Distortion increases in a video stream with every loss of frame. At each hop along the path from source to destination the value of distortion depends on the positions of the unrecoverable video frames in the GOP. Multilayer design approach is used in our model as shown in Fig1. Evolution of frame losses in GOP are designed in an analytical model which used to outline the dynamic behaviour of the process instead of just focussing on a single network quality metric such as packet-loss probability. The probability of frame loss in GOP is matched with probability of packet loss on a link. Video distortion metric is then directly related to probability of frame loss. Routing can be posed as an optimization problem by using the above mapping from packet loss probability to video distortion where the objective is to minimize the end to end distortion by finding the path from source to destination [4]. In our conception, along the complete path total history of losses in GoP is taken into report specifically compared to traditional routing such as total expected transmission count (ETX) [26] which is in contrast to our routing protocol where the links are independently treated. Frame loss process is captured using dynamic programming approach. To minimize distortion, we have designed a routing protocol based in the above solution. I-type frames which are longer frames among the three frames are carried on the paths that have least congestion since the loss of these frames that carry fine grained information affects the distortion metric more. With minimum distortion our routing scheme is optimized for transmission of video clips on wireless networks and constraints relating to time like jitter are not taken into account directly in the design [4]. A. Advantages of Proposed System 1) Impact of routing on video distortion is developed using a systematic approach: A systematic approach that captures the impact of routing on the end to end quality of video in terms of distortion is the primary contribution. Minimum distortion is attained by computation of optimal routes in the framework. Impact of Physical layer and MAC layer is jointly considered in the model and the application semantics on the video quality [4]. 2) Distortion resistant video delivery system is designed using a practical routing protocol: In accordance to the distortion and the position of a frame in the GoP, the source is used to collect distortion information on the links in the network designed in the protocol. Primarily wireless video is carried on the network using this routing protocol [4]. 3) Extensive experimentation done for evaluations: End to end video distortion is kept to a minimum and proved by using the protocol which is tested by simulations and real-time experimentation using an 802.11a mulihop network. Peak Signal to Noise Ratio of video traffic is increased by 20% while using this protocol. This produces traffic with a MOS (Mean Opinion Score) that is 3 times higher when compared to traditional routing schemes. Quality of video received at the destination is improved significantly with gains in PSNR and MOS [10]. Different system parameters are also used to evaluate our protocol [4].

IV.PERFORMANCE EVALUATION AND SIMULATION RESULTS

The proposed approach comprises the accompanying steps: Multihop routing networks, Video distortion model, Video distortion minimization and Video distortion dynamics. Multi-jump cell system (MCN) is a design proposed for remote correspondence and MCNs join the advantages of having a settled base of base stations and the adaptability of specially appointed systems. They are equipped for accomplishing much higher throughput than current cell frameworks, which can be named single-jump cell systems (SCNs). This work focuses on MCNs and SCNs utilizing the IEEE 802.11 standard for remote LANs. We give a general outline of the engineering and the issues required in the configuration of MCNs, specifically the difficulties to be met in the configuration of a directing convention. We propose a steering convention for use in such systems. We lead broad test contemplates on the execution of MCNs and SCNs under different burden conditions (both TCP and UDP). At that point concentrates plainly demonstrate that MCNs with the proposed steering convention are a suitable option for SCNs, truth be told they give much higher throughput

V.RESULTS

Solution to the problem is based on a dynamic programming approach that effectively captures frame-loss process. A practical routing protocol is designed to minimise the distortion. The loss of the longer I-frames carry information affects the distortion metric more. The approach ensures that these frames are carried on the paths that experience the least congestion.

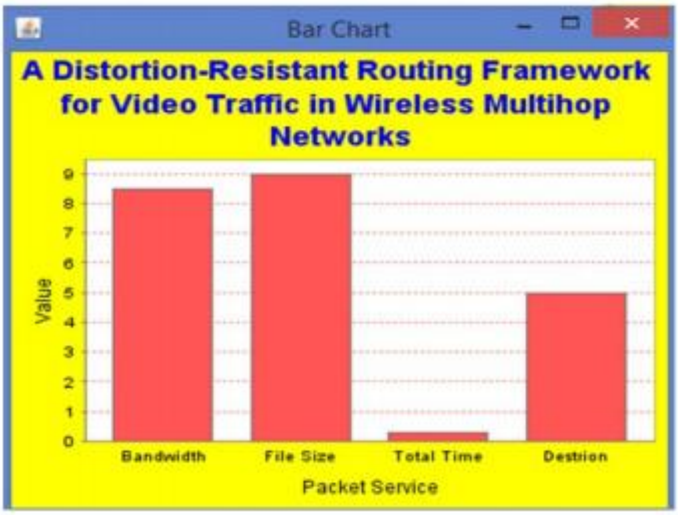

Fig 3: Proposed Distorition Resistant Routing Algorithm

VI.CONCLUSION

Due to the flaws and drawbacks of existing system in providing distortion free video an Analytical framework was developed using multihop wireless network to reduce the distortion while sending the video from source to destination. The Analytical framework uses the newly designed distortion resistance routing protocol for minimization of distortion in the video. The Proposed model improves the video quality by minimization of the distortion. Multiple videos can be sent to destination node at a time. The Text message sent along with video can be encrypted using cypher text methods.

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