



VIDEO TRAFFIC IN WIRELESS MULTI HOP NETWORKS USING DISTORTION-RESISTANT ROUTING FRAMEWORK

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ABSTRACT:

Traditional routing metrics designed for wireless networks are application-agnostic. In this paper, we consider a wireless network where the application flows consist of video traffic. From a user perspective, reducing the level of video distortion is critical. We ask the question “Should the routing policies change if the end-to-end video distortion is to be minimized?” Popular link- quality-based routing metrics (such as ETX) do not account for dependence (in terms of congestion) across the links of a path; as a result, they can because video flows to converge onto a few paths and, thus, cause high video distortion. To account for the evolution of the video frame loss process, we construct an analytical framework to, first, understand and, second, assess the impact of the wireless network on video distortion. The framework allows us to formulate a routing policy for minimizing distortion, based on which we design a protocol for routing video traffic. We find via simulations and test-bed experiments that our protocol is efficient in reducing video distortion and minimizing the user experience degradation.

INTRODUCTION:

With the advent of smart phones, video traffic has become very popular in wireless networks. In tactical networks or disaster recovery, one can envision the transfer of video clips to facilitate mission management. From a user perspective, maintaining a good quality of the transferred video is critical. The video quality is affected by: 1) the distortion due to compression at the source, and 2) the distortion due to both wireless channels induced errors and interference. Video encoding standards, like MPEG-4 [1] or H.264/AVC [2], define groups of I-, P-, and B-type frames that provide different levels of encoding and, thus, protection against transmission losses. In particular, the different levels of encoding refer to: 1) either information encoded independently, in the case of I-frames, or 2) encoding relative to the information encoded within other frames, as is the case for P- and B- frames. This Group of Pictures (GOP) allows for the mapping of frame losses into a distortion metric that can be used to assess the application-level performance of video transmissions. One of the critical functionalities that is often neglected, but affects the end-to-end quality of a video flow, is routing. Typical

routing protocols, designed for wireless multi hop settings, are application- agnostic and do not account for correlation of losses on the links that compose a route from a source to a destination node. Furthermore, since flows are considered independently, they can converge onto certain links that then become heavily loaded (thereby increasing video distortion), while other sare significantly underutilized. The decisions made by such routing protocols are based on only network (and not application) parameters. In this paper, our thesis is that the user-perceived video quality can be significantly improved by accounting for application requirements, and specifically the video distortion experienced by a flow, end-to-end. Typically, the schemes used to encode a video clip can accommodate a certain number of packet losses per frame. However, if the number of lost packets in a frame exceeds a certain threshold, the frame cannot be decoded correctly. A frame loss will result in some amount of distortion. The value of distortion at a hop along the path from the source to the destination depends on the positions of the unrecoverable video frames (simply referred to as

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frames) in the GOP, at that hop. As one of our main contributions, we construct an analytical model to characterize the dynamic behavior of the process that describes the evolution of frame losses in the GOP (instead of just focusing on a network quality metric such as the packet-loss probability) as video is delivered on an end-to-end path. Specifically, with our model, we capture how the choice of path for an end-to-end flow affects the performance of a flow in terms of video distortion. Our model is built based on a multilayer approach as shown in Fig.1. The packet-loss probability on a link is mapped to the probability of a frame loss in the GOP. The frame-loss probability is then directly associated with the video distortion metric. By using the above mapping from the network-specific pro

EXISTING SYSTEM:

Different approaches exist in handling such an encoding and transmission. The Multiple Description Coding (MDC) technique fragments the initial video clip into a number of sub-streams called descriptions. Standards like the MPEG-4 and the H.264/AVC provide guidelines on how a video clip should be encoded for a transmission over a communication system based on layered coding. Typically, the initial video clip is separated into a sequence of frames of different importance with respect to quality and, hence, different levels of encoding. In another existing model, an analytical framework is developed to model the effects of wireless channel fading on video distortion. In other existing model, the authors examine the effects of packet-loss patterns and specifically the length of error bursts on the distortion of compressed video.

DISADVANTAGES OF EXISTING SYSTEM:

From a user perspective, maintaining a good quality of the transferred video is critical. The video quality is affected by: 1) the distortion due to compression at the source, and 2) the distortion due to both wireless channel induced errors and interference. The model is, however, only valid for single-hop communication. The existing model is used not only for performance evaluation, but also as a guide for deploying video streaming services with end-to-end quality-of-service (QoS) provisioning.

PROPOSED SYSTEM:

In this paper, our thesis is that the user-perceived video quality can be significantly improved by accounting for application requirements, and specifically the video distortion experienced by a flow, end-to-end. Typically, the schemes used

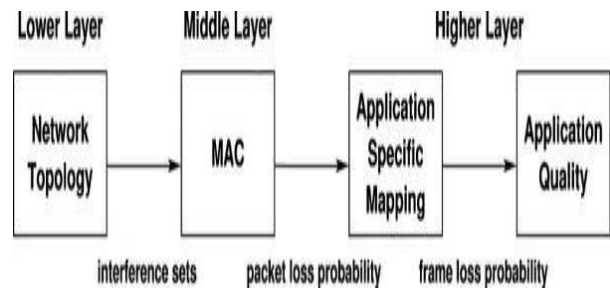
to encode a video clip can accommodate a certain number of packet losses per frame. However, if the number of lost packets in a frame exceeds a certain threshold, the frame cannot be decoded correctly.

A frame loss will result in some amount of distortion. The value of distortion at a hop along the path from the source to the destination depends on the positions of the unrecoverable video frames (simply referred to as frames) in the GOP, at that hop. As one of our main contributions, we construct an analytical model to characterize the dynamic behavior of the process that describes the evolution of frame losses in the GOP (instead of just focusing on a network quality metric such as the packet-loss probability) as video is delivered on an end-to-end path. Specifically, with our model, we capture how the choice of path for an end-to-end flow affects the performance of a flow in terms of video distortion. Our model is built based on a multilayer approach.

ADVANTAGES OF PROPOSED SYSTEM:

Our solution to the problem is based on a dynamic programming approach that effectively captures the evolution of the frame-loss process. Minimize routing distortion. Since the loss of the longer I-frames that carry fine-grained information affects the distortion metric more, our approach ensures that these frames are carried on the paths that experience the least congestion; the latter frames in a GOP are sent out on relatively more congested paths. Our routing scheme is optimized for transferring video clips on wireless networks with minimum video distortion.

SYSTEM ARCHITECTURE:



MODULES:

- Distortion.
- Distortion-resistance.
- Time based.

Packet based.

MODULES DESCRIPTION:

DISTORTION:

Distortion is the alteration of the original shape (or other characteristic) of something, such as an object, image, sound or waveform. Distortion is usually unwanted, and so engineers strive to eliminate distortion, or minimize it. Video processing systems may introduce some amount of distortion or artifacts in the video signal, which negatively impacts the user's perception of a system. For many stakeholders such as content providers, service providers and network operators, the assurance of video quality is an important task. In video, distortion usually refers to changes in the luminance or chrominance portions of a signal. In audio, distortion refers to any undesired changes in the waveform of a signal caused by the introduction of spurious elements.

Distortion-resistance:

Our analysis is based on the model for video transmission distortion. The distortion is broken down into source distortion and wireless transmission distortion over a single hop. Instead of focusing on a single hop, we significantly extend the analysis by developing a model that captures the evolution of the transmission distortion along the links of a route from the source node to the destination node. Assuming that the packet losses in different frames in the GOP are independent events (likely if the fading patterns change in between), the transition probabilities for the process, can be computed.

Packet Based Transmission:

Simply known as Packet switching and it is similar to message switching using short messages. Any message exceeding a network-defined maximum length is broken up into shorter units, known as packets, for transmission; the packets, each with an associated header, are then transmitted individually through the network. The fundamental difference in packet communication is that the data is formed into packets with a pre-defined header format (i.e. PCI), and well-known "idle" patterns which are used to occupy the link when there is no data to be communicated.

Packet network equipment discards the "idle" patterns between packets and processes the entire packet as one piece of data. The equipment examines the packet header information (PCI) and then either removes the header (in an end system) or forwards the packet to another system. If the out-going link is not available, then the packet is placed in a queue until the link becomes free. A packet network is

formed by links which connect packet network equipment.

Time Based Transmission:

In telecommunication networks, the transmission time, is the amount of time from the beginning until the end of a message transmission. In the case of a digital message, it is the time from the first bit until the last bit of a message has left the transmitting node. The packet transmission time in seconds can be obtained from the packet size in bit and the bit rate in bit/s as: Packet transmission time = Packet size / Bit rate. In case of a network connection mediated by several physical links and forwarding nodes, the network delivery time depends on the sum of the delivery times of each link, and also on the packet queuing time (which is varying and depends on the traffic load from other connections) and the processing delay of the forwarding nodes. In wide-area networks, the delivery time is in the order of milliseconds.

Optimal Routing Policy:

In this module, our objective is to find the path that yields the minimum video transmission distortion between any source and destination. By using the analysis presented, we pose the problem as a stochastic optimal control problem where the control is the selection of the next node to be visited at each intermediate node from the source to the destination. In essence, the MDR routing policy distributes the video frames (and the packets contained therein) across multiple paths and in particular minimizes the interference experienced by the frames that are at the beginning of a GOP (to minimize distortion). The I-frames are longer than other frames. Their loss impacts distortion more, and thus these are transmitted on relatively interference-free paths. The higher protection rendered to I-frames is the key contributing factor in decreasing the distortion with MDR.

SYSTEM REQUIREMENTS: HARDWARE REQUIREMENTS:

System : i3/i5.
Hard Disk : 500 GB.
Monitor : LCD.
Ram : 2 GB

SOFTWARE REQUIREMENTS

Operating system : Windows 8.

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Coding Language : JAVA
IDE : Eclipse
Database : MYSQL

CONCLUSION

In this paper, we argue that a routing policy that is application-aware is likely to provide benefits in terms of user-perceived performance. Specifically, we consider a network that primarily carries video flows. We seek to understand the impact of routing on the end-to-end distortion of video flows. Toward this, we construct an analytical model that ties video distortion to the underlying packet-loss probabilities. Using this model, we find the optimal route (in terms of distortion) between a source and a destination node using a dynamic programming approach. Unlike traditional metrics such as ETX, our approach takes into account correlation across packet losses that influence video distortion. Based on our approach, we design a practical routing scheme that we then evaluate via extensive simulations and test bed experiments. Our simulation study shows that the distortion (in terms of PSNR) is decreased by 20% compared to ETX-based routing. Moreover, the user experience degradation due to increased traffic load in the network is kept to a minimum.

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