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Effect of CBR and VBR traffic on SVC Streaming over Wireless Networks

Heena Gupta[1], Dr Simmi Dutta[2], Sidhant Sharma [3]

[1,2] Computer Department, GCET, Jammu, J&K, India- 180010
[3] Computer Department,GNDU,Amritsar,Punjab,India- 143005
Email: heenagupta1.2011@gmail.com, simmidutta15@gmail.com

Abstract- For streaming applications UDP is used as transport protocol. The reason for choosing UDP is that the latency which can be introduced by retransmissions when using TCP is not suitable for video streaming and the video streams are loss tolerant to some extent. Since UDP does not provide congestion control, the application layer must provide this function. Scalable video coding compression technique is used to provide the scalability of the video bit stream. The study of effect of constant and variable bit rate of SVC video format gives us the idea that if the network traffic in the wireless network is less it is desirable to send the video packets at a constant rate otherwise some optimization tools must be used.

INTRODUCTION

The video delivery, systems are broadly classified as streaming and broadcast systems[1]. The main idea of video streaming is to divide the video into small parts, transmit these parts in succession, and enable the receiver to decode and playback the video as these parts are received, without having to wait for the entire video to be delivered. Video streaming can conceptually be thought to consist of the follow steps:

1) Partition the compressed video into packets

2) Start delivery of these packets

3) Begin decoding and playback at the receiver while the video is still being delivered.

Video streaming over wireless networks is compelling for many applications, ranging from home entertainment to surveillance to search-and-rescue operations .While video streaming requires a steady flow of information and delivery of packets by a deadline, wireless radio networks have difficulties to provide such a service reliably .As the wireless link quality varies, video transmission rate needs to be adapted accordingly. In case of video streaming, commercial applications and most research work use conventional hybrid video coding. In case of video-on-demand, the data rate of a hybrid coded bit stream can be coarsely adapted by dropping frames with lower priority or by extensive transcoding.

There are a number of basic problems that afflict video streaming. Video streaming over the Internet is difficult because the Internet only offers best effort service. That is, it provides no guarantees on bandwidth, delay jitter, or loss rate. Specifically, these characteristics are unknown and dynamic. Therefore, a key goal of video streaming is to design a system to reliably deliver high-quality video over the Internet when dealing with unknown and dynamic:

1. Bandwidth

2. Delay jitter

3. Loss rate

Scalable video coding (SVC)

Scalable Video Coding (SVC) was standardized as an extension of H.264/AVC. Conceptually, the design of H.264/AVC covers a Video Coding Layer (VCL) and a Network Abstraction Layer (NAL). While the VCL creates a coded representation of the source content, the NAL formats these data and provides header information in a way that enables simple and effective customization of the use of VCL data for a broad variety of systems.

The architecture of the H.264/SVC standard is particularly designed to increase the codec capabilities while offering a flexible encoder solution that supports three different scalabilities: temporal, spatial SNR quality. Video scalability is achieved in the temporal, spatial, quality (SNR), or any combination of these domains [2].

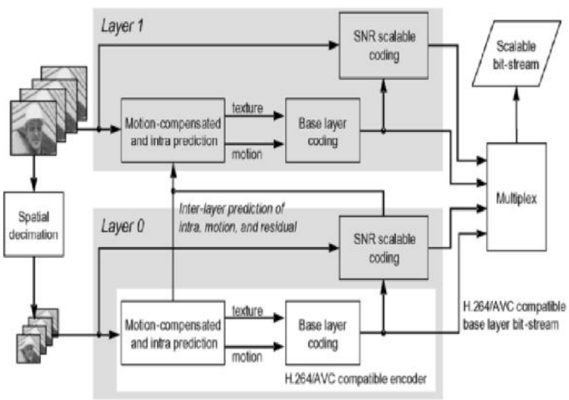

Figure 1 SVC Architecture [1]

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STEPS FOR IMPLEMENTATION

The various steps involved in implementation are
Step1: Encoding Process
a) A YUV video is encoded in H.264 video file
b) Generation of original NALU trace file
Step2: NS2 Sender Agent
a) NALU trace file is converted into NS2 traffic trace file
b) Each record of the file is read and corresponding number of packets are generated
Step3: NS2 Receiver Agent
a) The frame level trace file, NS2 traffic trace file, original NALU trace file are used to generate received NALU file
Step4: Decoding Process
a) The receiver generates in real time trace of received NALUs
b) The received NALU trace is processed to produce a YUV file.

IMPLEMENTATION

Simulation Platform

To implement the proposed architecture examples of H.264/SVC transmissions over IEEE 802.11 is provided. The test video source, Foreman, used in the simulation is in YUV CIF (352 × 288) format and comprises 300 frames. JSVM (version 9.19) is used to encode the video with only temporal scalability enabled. Spruce-0.2.1 is used to calculate the path capacity. SVEF 1.4 framework is used to provide intermediate between JVSM and ns2.35 scenario.

RESULTS

The simulation is carried out and the video result is evaluated for two different flow
1. CBR (Constant Bit Rate)
2. VBR (Variable Bit Rate)

Delay

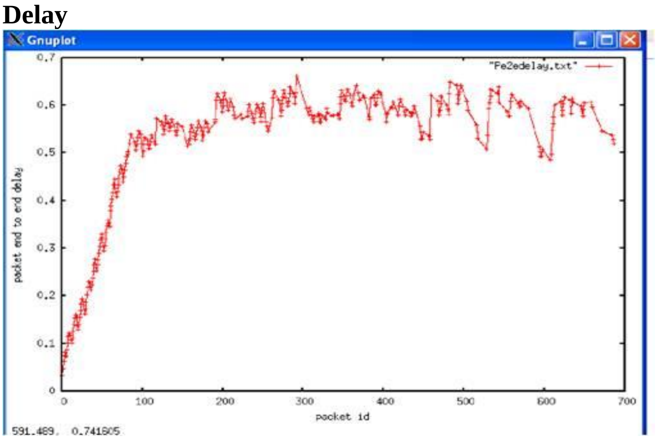

Figure 2 Packet end to end delivery when the packet are send at constant rate.

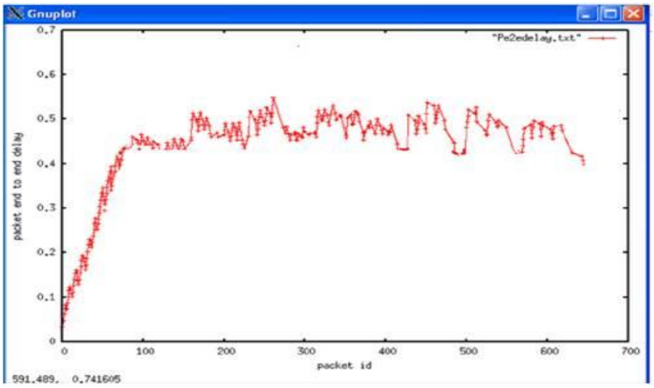

Figure 3 Packet end to end delivery when the packet are send at variable rate

Average PSNR Ratio

CBR	17.0566
VBR	16.8542

Visual Comparison

Figure 4 Original Foreman video file Frame number 3 and Frame number 23

Figure 5 Frame number 3 and Frame number 23 for constant rate

Figure 6 Frame number 3 and Frame number 23 for variable rate

CONCLUSION

Sending the packets at constant bit ratio increased the delay parameter but maintain a desirable PSNR ratio ,when the packets were send at variable rate reduced the delay at the receiver end but the packet received contained noise and PSNR ratio was reduced. Hence if the network traffic in the wireless network is less it is desirable to send the video packets at a constant rate

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