Improved IPTV Services in IPv4 and IPv6 Environments Based on Wireless Networks

Imlitoshi Jamir, Leo Satminlien Singsit

Abstract- Today's modern Internet Technology is based on Internet Protocol for all means of communication between two end systems. The current Internet usage is predominantly dominated by IPv4 version of IP but due to the outburst in the number of Internet users in the past years IPv4 addresses will soon be depleted. Ipv4 provided a limited address space so there is a need to move to IPv6 which is an enhancement over its older version and overcomes most of the drawback seen in the earlier version. However migrating to IPv6 from IPv4 would be a herculean task since the present infrastructure is built to suit the IPv4 environment. Here in this paper the primary objective is to implement IPTV by considering the Video on Demand services. The network type is converted to WaveLan for effective bandwidth utilization and efficient communication. The present work here involves 2 types of works. First TCP IPv4 based work and second is TCP IPv6 Based work, where the TCP IPv6 Based work is again comprised of the outcome without optimization and with optimization. The presented work is expected to improve the network QOS and the network reliability in case of overloading and underloading conditions. We performed the various simulations on Network Simulator 2.35 and analyzed the three types of traffic. Video on Demand services generally involves transmitting huge amount of data over such networks requiring a considerable data rate.

Keywords- AODV , DVB-IPTV , IPTV, VOD.

I. INTRODUCTION

IPTV is a multichannel, Internet protocol Television which has the capability to deliver multiple contents. IPTV is considered to be the killer application for the next generation Internet and will provide exciting new revenue opportunities for service providers [1]. IPTV does not rely on the cables or satellites for gathering the signals but instead uses a broadband line [2]. This makes it possible for a user to gain the IPTV services even from personal computer or mobile devices. DVB-IPTV utilizes MPEG-2 Transport Streams (MTS) to encapsulate transmission of digital television.

II. ANALYSIS OF WAVELAN

In order to perform the simulation on WaveLAN networks we make use of AODV as the routing protocol. AODV enables dynamic, self-starting, multihop routing between participating mobile nodes wishing to establish and maintain an ad hoc network. AODV is used as the routing protocol because it grants mobile nodes to gather the routes at a faster pace for new destinations [3]. The other advantage of using AODV is that, it does not necessitate nodes to maintain routes to destinations that are not in active communication.

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AODV also permits mobile nodes to react to link failure and changes in network topology. When links breaks down, AODV can perform a mechanism whereby the affected set of nodes are informed, so that they are able to cancel the routes using the lost link.

A. Proposed Scheme

Here a server node is defined along the client node. The server node holds large amount of data in the form of video and the client will performs the request on the server. An attempt is made to improve the QOS while communicating such large amount of data over the network. The intermediate nodes between the server and the client will act as the monitor node as well as the intermediate server node. The intermediate node will monitor the next and the previous node of the main active client node. The function of these nodes is to balance the network congestion so that the effective communication will be performed. To improve the network throughput and effective delivery we have defined our model under such characteristics.

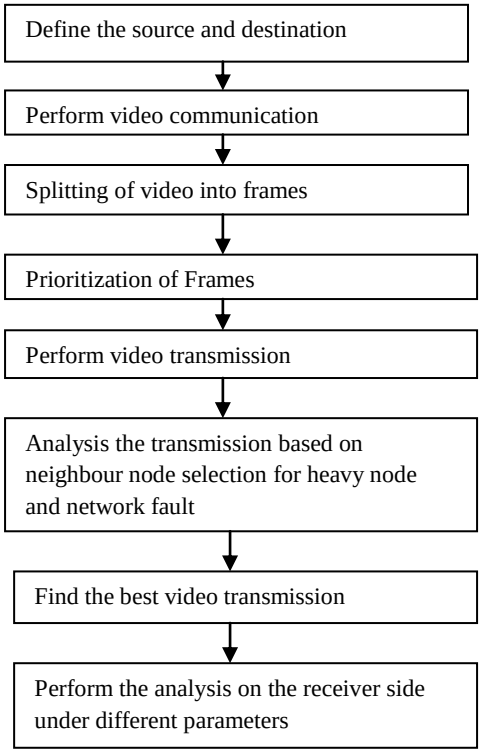

Figure 1. Flow Chart of Proposed Approach

The proposed algorithm uses the following steps listed below.

Step 1: Define the Source Node S and Designation Node D.

Step 2: Convert the Video file to trace file to perform the changing size and rate based communication.

Step 3: Convert the network type to WaveLan so that the effective bandwidth utilization and the efficient communication will be performed.
Step 4: Divide the video in smaller fragment to perform the multipath communication.
Step 5: Extract the video frame from the segment.
Step 6: Take the routing Decision based on the Frame type.
Step 7: Perform the network analysis in terms of number of packets, data lost etc.

III. SYSTEM ARCHITECTURE

The proposed work is simulated in the form of client server and intermediate router. Here the problem is discussed under the effect of modulation scheme. It gives the simulation on how the modulation parameter itself is effective to solve the problem of bottle neck as well the problem of bad node over the network. The presented system will improve the throughput in case of congestion and any noise over the network. The system gives the effective use of available bandwidth.
The TCP based work proposed Approach implements a window based flow control mechanism. A window based Architecture allows the data to be transmitted in the form of blocks. The window size is defined as the number of data values transferred at once. In this system flow control was governed simply by the maximum allowed window size advertised by the receiver and the policy that allowed the sender to send new packets only after receiving the acknowledgement for the previous packet.
After the occurrence of congestion collapse in the network some congestion detection and avoidance approach is required. Here the bandwidth optimization along with modulation scheme is suggested to get the maximum utilization of the bandwidth and to get the maximum throughput over the network. The work also includes the concept of fault detection over the network and the implementation of respective modulation scheme to over the fault loss over the network.
The presented TCP IPv4 based work is performed on the TCP protocol under the following constraints-

A. Changing Communication window Size

The communication window defines the data to be transferred at one time during the communication phase. The concept of changing window is useful to handle the overloading as well as the underloading conditions. In case of overloading, if the bandwidth is already occupied by other transmission, the window size can be reduced so that no more extra load will be there in the communication. In the case of underloading, when the network bandwidth is free, the window size will be increased to obtain the higher throughput.

B. Changing Propagation

Propagation is one of the effective factors to perform the reliable and efficient communication over the network. An effective propagation ratio is helpful to control the communication delay so that the effective communication will be performed. The propagation is generally based on the estimation or the analysis of the network nodes or the communication. The propagation basically deals with the response time as well as the network delay. To perform the reliable network, another optimum approach is to control the communication time in terms of delay and the response analysis. In this work, we have performed a controlled network propagation to perform effective communication.

C. ACK Reduction

Another approach considered here is to perform the ACK of the communication in a scheduled manner or when some error/fault occurs during the communication. This work reduces the ACK packets so that overall network communication will be reduced and the network communication will be effective.
In case of TCP IPv6 based work, as the protocol is a routing protocol we have taken the effective routing decision to perform the effective video communication over the network. The work done in this stage is divided in three levels:

A. Video Communication Properties

To perform the effective communication, instead of transforming the data at a constant rate, the trace based traffic communication is performed. Such kind of traffic type is predefined in NS2 that allow a user to send data in variable packet sizes as well as irregular intervals. It means it allows the changing window communication for the video traffic for both the overloading and underloading conditions.

A. WaveLan Communication

Another change performed in this work is to handle the network in the form of WaveLan network. Such kind of communication is defined with the knowledge of carrier sensing and the collision analysis. It provides an encoded communication over the network so that the effectiveness of the network will be increased. It also performs the slight compression so that the efficiency of the communication is also increased.

B. Frame Type based Re-Routing

MPEG video file contains different kind of frames such as I Frame, P Frames, B Frames [4]. In this work, the video file is divided in the form of small fragments and from each fragment, the frame extraction is performed. As the frame is analyzed based on the frame type the routing decision is performed so that the network load will be reduced and the effective communication will be performed. Along with analyzing the frame type the packet transmission over that node is also analyzed. As we can see, the presented work is performed by the routing protocol as well as the transport protocol it improves the network communication.
Here we have optimized the TCP IPv6 based work by adjusting the window framing time and the communication. As we know the framing is used to send the video frames in segmented format but if the framing delay is high then the communication will get slow. If the framing delay is low, then it can result data loss. As a result, there is a need for optimized mapping between the communication delay and the framing delay.
Here we have optimized the framing. Framing is done based on the fragmented-size. In an optimize framing mode, for a fragmentation of 1024 size window, it required about 25 ms as the framing time in case of IPv6. We have adjusted the values respectively to obtain the best effect of the protocol. Here the frames that are not compressed are given highest

priority whereas the frames with compression are having the lesser priority.

IV. SIMULATION SCENARIOS

We present the procedure to achieve video on demand services in mobile ad hoc network that claims to reduce the packet loss, delay time, total utilization of bandwidth and resources, improved throughput in the 3 scenarios i.e. TCP IPv4, IPv6 and optimization in IPv6 based work.
The video transmission between the nodes in TCP IPv4 based environment.

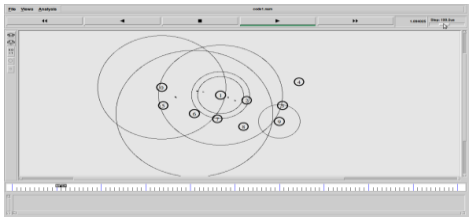

Figure 2. TCP IPv4 based work traffic

Packet loss that was seen in the TCP IPv6 based work.

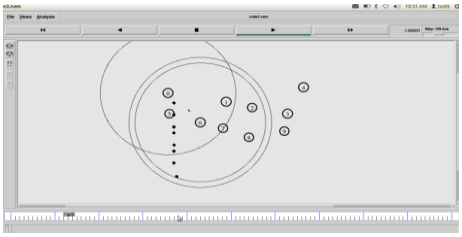

Figure3. Problems in TCP IPv6 based work

Here TCP IPv4 work is represented by red line, presented work on TCP IPv6 by blue line and non- optimized TCP IPv6 by green line. The graph below shows the comparison of numbers of packets send in once between the 3 types of work. Thus we observe that our work on IPv6 closely resemble to that of IPv4.

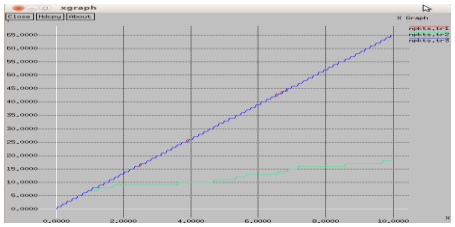

Fig 3. Transmission of npackets with time

We observed that the packet loss for the IPv4 and optimized IPv6 based is reduced to the maximum possible extent.

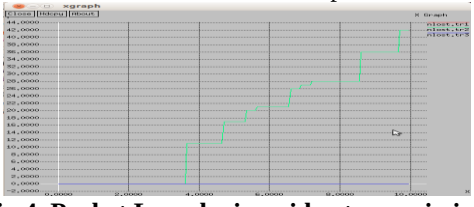

Fig 4. Packet Loss during video transmission

The graph below shows the packet delay incurred during the transmissions. The packet delays during the transmission are reduced by using caching approach. This graph clearly shows that the packet delay in TCP IPv4 and optimized work on TCP IPv6 is lowered as compared to TCP IPv6 based work.

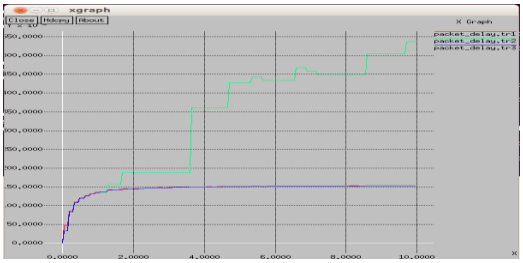

Figure 6. Packet Delay in video transmission

V. CONCLUSION

Here we focus on the architecture for VOD, complete utilization of bandwidth and resources are achieved with the help of TCP IPv4 based work and TCP IPv6 based work. Prioritization approach is used to decrease the load of the network. Prioritization is done with the help of frame analysis. We evaluate the throughput of the VOD service on behalf of complete bandwidth utilization and resources utilization. In this work we use the modulation parameter and data is sending in the form of blocks. Window size is set according to load on the network.
This work can be further enhanced in future under different directions. We have performed the work with MPEG videos. Same kind of work can also be performed for some other video file formats. The work can be enhanced for handling different type of attacks over the network. Here the concept is implemented specific to the TCP protocol, same kind of work can also be performed with other protocols also.

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