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Dynamic Resource Reservation and Congestion Control in Real Time Communication System

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Abstract— In real time communication, resource management is very much important to control the congestion of the network. Here we are going to propose an algorithm to allocate resource dynamically at the streaming time. Also we are trying to control the bit rate of data packets to overcome the congestion and maintain the QoS of the video at the receiver end. Also we have to maintain the scalability of the network and minimal number of packet loss and low delay. When continuously data streaming is going on, the network may jammed. At that moment we have to control the data transmission speed so that we can prevent the data packet loss. Here we are going to use variable bit rate (VBR) [2] concept to control the data transmission speed over the network. We also try to reduce the resources wastage at streaming time.

Keywords— VBR, ingress node, egress node, QoS, congestion, data packets, threshold bandwidth

INTRODUCTION

To prevent the resource wastage at the network, we are going to use dynamic resource reservation at the network. User sends request to server to access the data content. Data packets are divided and distributed over the network. Depending upon the threshold bandwidth, data packets chose the available routers and create path. There is an init () message, which initiate the transmission. Another is feedback () message by which we can know about the traffic of the network. If some network domain is congested, we send a feedback () message to the previous domain to control the data transmission speed. Resources are reserve for a flow according to the threshold bandwidth.

RESOURCE RESERVATION

In real time communication system we can reserve resources in two ways. We can reserve some certain amount of resources previously that is statically or we can reserve resources dynamically at run time. Here we are discussing about the dynamic resource reservation technique to maintain the QoS of the network.

Dynamic reservation is based on online network traffic prediction [5]. This is called predictive dynamic bandwidth allocation. Predictive dynamic bandwidth allocation is two types, like direct and indirect. There are some problem in direct predictive bandwidth allocation method, like signal, time prediction problem.

In our proposed algorithm we dynamically reserve resources based on the feedback () and init () message. We uses DiffServ domain to implement our method. In DiffServ [1] domain there is two boundary routers and some core routers in between them.

CONTROL BY CHANGING BIT RATE

In real time communication system bit rate can be constant or variable. In constant bit rate method the data transmission speed is same all over the network and in all times.

Here we are trying to control the data speed with variable bit rate. VBR can be prerecorded or can be real time. In prerecorded VBR the data transmission speed is fixed. In case of real time VBR, the data packet transmission depends on the congestion happens on the network traffic. Video transmission is one of the examples of real time VBR. We are implementing this concept on DiffServ domain. In DiffServ domain we control the aggregate of flow. In each DiffServ domain there is two boundary router (ingress and egress), one is ingress and another is egress and some core routers. The bit rate is calculated and controlled at boundary router. Core router is only forwarded the data packets.

PROPOSED ALGORITHM

Let, the total data is **N**
No. of router present K
Threshold bandwidth BW_T
Bit Rate R

Initialize N
Data are divided into n_1, n_2, n_3…..n_x packets.

Send init () message

For i<- 1 to K
// Check the available ingress router (from 1 to K^{th} router) which has threshold bandwidth value.

{

If $\sum_{i=1}^{x} N_i > BW_T$
// If the total packet size is greater than BW_T, then
{

$\sum_{i=1}^{a} N_i$, $\sum_{i=a+1}^{b} N_i$ ……$\sum_{i=b+1}^{z} N_i$ (where a, b,…..z are the ingress routers)

// the data packets are divided and grouped as per the 'Data distributor' policy
}
//Chose the next path where sufficient bandwidth is available and reserve the required resource
insert (N_i)
if (Domain is congested)
{
feedback ()
//feedback to the previous domain to reduce the bit rate

R=R-1
// reduce bit rate of the previous domain
forward (N_i)
//data packets are forwarded to the core routers of a domain

}
else
forward (N_i)

}
feedback ()
{
..
}
//feedback message send to server

Description:

User sends request to the server to access the data. The data are divided into different packets and waited in a queue. Then these are come to the 'data distributor' where all packets are marked and assign precedence. Now data distributor sends init () message to the connected router (ingress node). Depending upon the precedence, data packet makes group. Here we store the information about aggregate of flow. It will be checked by init () message in which domain, ingress router has available bandwidth. Mainly check the router's threshold bandwidth. If the data packets volume is greater than the available bandwidth, the data packets are make group and distributed in different path. Now data packets are able to transmit. At that time required resources are allocated for that flow. That means for a particular flow how much resource is required that much is only reserved. Remaining are stored for another use.

When data packets are forwarded, a feedback () message is generated and send it to the previous domain. If a domain is congested then the feedback () message goes to the previous domain to reduce the bit rate. When the data bit rate is reduced at the previous domain, the congestion of the present domain would also reduce. At that time previous domain may be congested due to bit rate reduction. So we have to make this process in synchronized way.

Actually by using the feedback () message we change the data transmission bit rate to reduce the congestion and maintain the QoS.

PICTORIAL REPRESENTATION

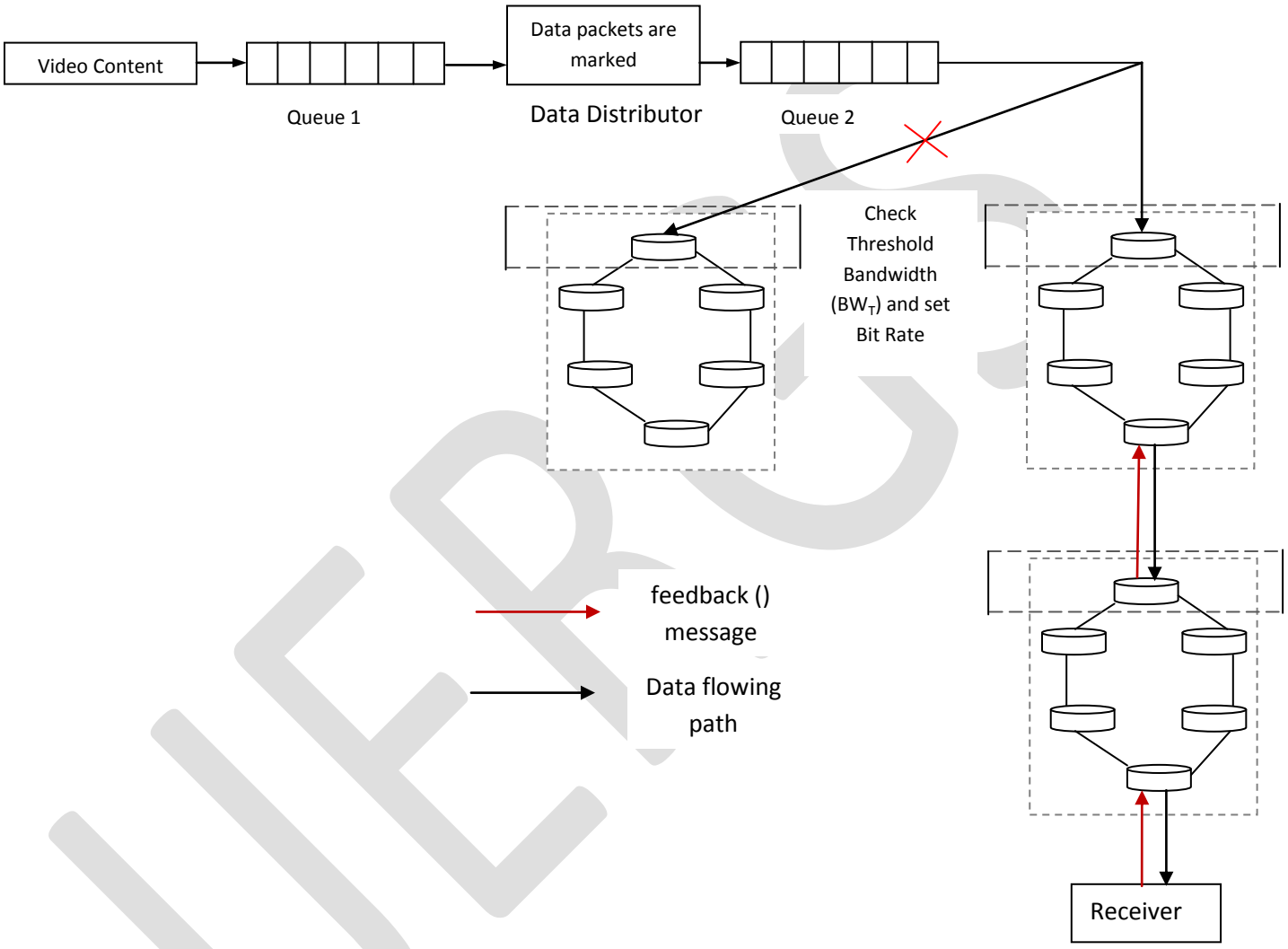

Fig. 1: Pictorial form of our method

1. Video contents are stored in the main server location. When user send the request to access the video file, then that are divided into small data packets and stored in a queue (In our diagram 'Queue 1') [3] and come to ISP (Internet service provider).
2. After that data packets are come to the 'Data distributor' part. Here the data packets are marked and assign precedence.
3. This marked and precedent data packets are then waited in a new queue, named 'Queue 2'.
4. Data packets are come to the available domain. In each domain the ingress node has assigned a particular threshold bandwidth. If the node has available bandwidth, then data packets can pass through that domain. Otherwise the packets are restricted to transmit.
5. The data packets makes new group according to the bandwidth availability and again check the threshold bandwidth of other domains.
6. If there is available bandwidth, then data packets are ready to transmission.

7. At that time required amount of resources are reserve for the particular flow. Remaining resources are stored for another flow.
8. At egress node of each domain we can manage the data transmission control speed as well as the congestion of the network by using variable bit rate (VBR).
9. If any congestion happens in any router, the threshold value of that domain increased.
10. A feedback () message is send to the previous domain to reduce the data passing speed.
11. Data bit rate will be normalized when congestion is under control.
12. So if any congestion happens, by using VBR, data transmission speed is restricted and congestion can be controlled.

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CONCLUSION

By using our algorithm we reserve resources at run time. That means we can reserve that much of resources which is required for a particular data flow. Also to avoid the congestion of the network we uses variable bit rate. If congestion happens in present domain, by using VBR we restrict the data bit speed in the previous domain. So in present domain congestion can be avoided but there may be problem occurs in previous domain due to the sudden reduction of data speed. So we have to control the bit rate in such a synchronized way that congestion can be controlled. We have to control the bit rate depending upon the network behavior. We can prevent the data bit loss by using this algorithm also we can maintain the quality of the content.

REFERENCES:

[1] Sauvik Bal, Professor Kaushik Banerjee, "Routing based on Receiver Feedback with Resource Reservation in Real Time Communication", International Journal of Innovative Research in Advanced Engineering (IJIRAE); Volume 1 Issue 10 (November 2014).
[2] Yao Liang, "Real-Time VBR Video Traffic Prediction for Dynamic Bandwidth Allocation", IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS, VOL. 34, NO. 1, FEBRUARY 2004.
[3] Min Wu, Robert A. Joyce, Hau-San Wong, Ling Guan, Sun-Yuan Kung, "Dynamic Resource Allocation via Video Content and Short-Term Traffic Statistics", IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 3, NO. 2, JUNE 2001.
[4] Dan Jurca, Pascal Frossard, "Video Packet Selection and Scheduling for Multipath Streaming", IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 9, NO. 3, APRIL 2007.
[5] Abdel-Karim Al-Tamimi, Raj Jain, Chakchai So-In, "Dynamic Resource Allocation Based on Online Traffic Prediction for Video Streams", Internet Multimedia Services Architecture and Application (IMSAA), 2010 IEEE 4th International Conference, 15-17 Dec. 2010.
[6] Min Wu, Joyce, R.A. , Hau-San Wong Zing Guan , Sun-Yuan Kung, "Dynamic resource allocation via video content and short-term traffic statistics", Multimedia, IEEE Transactions on (Volume:3 , Issue: 2), Jun 2001.
[7] Heyman, D., Lakshman, T.V.; Tabatabai, A.; Heeke, H., "Modeling teleconference traffic from VBR video coders", Communications, 1994. ICC '94, SUPERCOMM/ICC '94, Conference Record, 'Serving Humanity Through Communications.' IEEE International Conference, 1-5 May 1994