International Journal of Modern Engineering Research (IJMER)
www.ijmer.com Vol.1, Issue1, pp-090-094 ISSN: 2249-6645

Implementation of Network simulation for Distributed Explicit Rate Schemes in Multi-I/O Network Systems

DEVI PRIYA G
2/2 M.TECH CSE, DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
ANDHRA PRADESH, INDIA

B. RAMESH NAIDU
ASSOCIATE PROFESSOR
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
ANDHRA PRADESH, INDIA

Abstract— **This paper describes a novel multi-rate multicast congestion control scheme based on the well-known proportional plus integrative control technique, where the control parameters can be designed to ensure the stability of the control loop in terms of source rate. The congestion controller is located at the next upstream nodes of multicast receivers and has explicit rate (ER) algorithm to regulate the rate of the receivers. We further analyze the theoretical aspects of the proposed algorithm, show how the control mechanism can be used to design a controller to support many-to-many multi-rate multicast transmission based on ER feedback, and verify its agreement with simulations in the case of bottleneck link appearing in a multicast tree. Simulation results show the efficiency of our scheme in terms of the system stability, high link utilizations, fast response, scalability, high throughput and fairness.**

Index Terms— **explicit rate, multicast congestion control, multi-rate multicast, QoS (quality of service), rate-based congestion control.**

I. Introduction

With the ever-increasing wireless multicast data applications recently, considerable efforts have focused on the design of flow control schemes for Multicast congestion avoidance. There are generally two types of wireless multicast rate control schemes: Single-Rate Multicast (SR-M) and Multi- Rate Multicast (MR-M) [1, 2]. The SR-M is not fair to those receivers who are connected to high speed networks and are able to receive data at higher rates. Due to the diverse characteristics and requirements of receivers within a multicast group, it is desirable to have multicast sessions in which different receivers receive data at different rates. This is achieved by MR-M, where the source is able to transmit data to all receivers at different rates that suits the capacity of each individual receiver. Since in MR-M the capacities of network links to different receivers differ and traffic should be accordingly adjusted at the links with different capacities, flow control becomes a very challenging issue. For simplicity, we use multicast to refer wireless MR-M for the rest of the paper, unless otherwise specified.

Several multicast congestion control approaches [3,4] have been proposed recently. One class of approaches adopts a simple hop-by-hop feedback mechanism. Although the simple hop-by-hop feature seems to be an advantage, these approaches often lead to the so-called consolidation noise problem [5, 6] due to incomplete feedback information. To overcome this drawback, Xiong et.al [7] proposed the concept of feedback synchronization, at each branch point, by accumulating feedback from all downstream branches. These schemes of [6] and [7] then introduce another problem of slow transient response since the feedback from the congested branch may have to needlessly wait for the feedback from "longer" paths. Such delayed congestion feedback can cause excessive queue build-up and packet loss at the bottleneck link. The authors of [8] and [9] suggested that only a carefully chosen set of receivers, instead of all receivers, send their feedbacks to the sender. Zhang et al. [10] proposed an optimal second-order rate control algorithm to deal with control packet round-trip time (RTT) variation in multicast communications, which defined that the data transfer rate is adjusted at the source depending on the available bandwidth at the bottleneck. More recently, several studies (such as [11, 12]) have focused on the design of MR-MCC protocols. However, all of them have drawbacks. Some designs cause over-subscription and high packet losses. Some are slow to converge and unresponsive. Some designs are too complex and infeasible [13]

II. RELATED WORK

The advances in multi-input–multi-output (MIMO) systems and networking technologies introduced a revolution recently, which promises significant impact in our lives. Especially with ever-increasing multicast data applications, wireless and wired multicast (multipoint-to-multipoint) transmission has considerable effect on many applications such as teleconferencing and information dissemination services. Multicast improves the efficiency of multipoint data distribution from multiple sender's to a set of receivers [14,15].

This paper describes a novel MR-MCC congestion control scheme based on the proportional plus integrative (PI) controller. The incoming flow rate of a session, at every branching point in its tree, is enforced to be the maximum of the rates that can be accommodated by its participating branches. By doing so, the sending rate at the source will eventually be the maximum of the rates that can be accommodated by the entire paths to individual receivers. Since the source sends data at the maximum path rate, it is necessary to reduce the rate of an incoming flow at every branching point to the value that can be accommodated by its participating branches [13]. The PI controllers are located at the next upstream branch node of the receivers.

The relevant gain parameters of the PI controller are determined by the system stability. Each branch point in our scheme only receives feedbacks from the direct downstream nodes instead of all downstream nodes, thus it greatly decreases the number of feedbacks to be aggregated at one node. As a result, our scheme can avoid the so-called feedback explosion problem [13] to a great extent. Simulation results show the efficiency of the proposed scheme in terms of system stability, high link utilizations, quickly response, scalability, high system transport rate, intra-session fairness and intersession fairness. Simulation results verify the efficiency of the proposed MR-MCC scheme. Our scheme is very versatile. It can support sessions where receivers are added and depart. It can manage the traffic to guarantee stability, in real time, even if considerable changes occur in the source-receivers tree.

III. PROPOSED SYSTEM ARCHITECTURE

To analyze the performance and characteristic of the multicast, we focus on the following system model as shown in figure 1, where we have two classes of sources, i.e., one multicast source and one end-to-end CBR source. The PI controllers are located at the next upstream nodes of the receivers, i.e., the routers from RT I to RTm , and compute the expected rates used to adjust the multicast receiving rates of the downstream receivers. The receiver ji represents the ith receiver corresponding to the jth router (RT j). We provide rate adaptation functionality at every branch point of each session. This rate adaptation scheme is determined on the basis on the fact that the multicast tree will eventually receive data at an independently trimmed rate allowed by its entire path. So we acquire the above computed maximum value as the effective sending rate of the multicast source. The sending rate is necessary to convert down the rate of an incoming flow at every branching point to the values that can be accommodated by its participating branches to individual receiver.

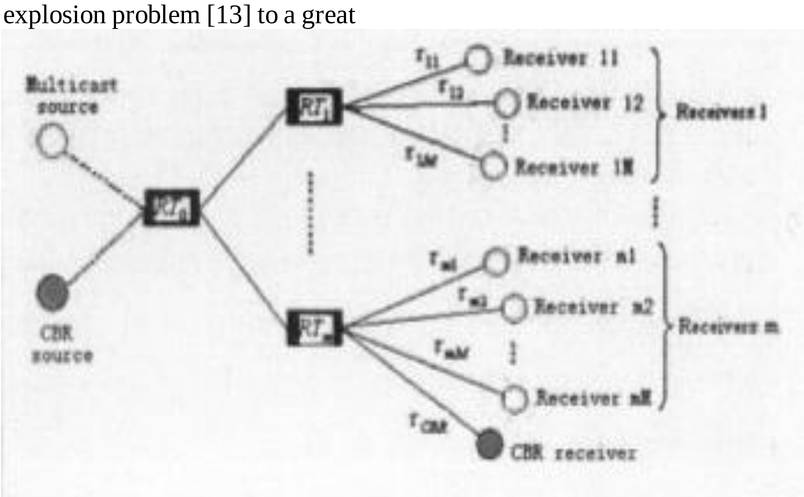

Fig 1 System Architecture

Algorithm

Source Algorithm
Upon every T epoch Transmit data including FCP; Upon multicast source receives a consolidation BCP from its downstream Adjust the transmitting rates in terms of min(the maximum receiving rate of corresponding receivers in the consolidated BCP, the bandwidth of the connective link);
Router Algorithm

If multicasttree[i]==1
{
    If the packet is an FCP
    {
    Put the packet in the buffer;
    Multicast the data packet including FCP to the downstream nodes;
    }
    else
    {
            If the node is the next upstream node of the receiver j
            {
            Computer the expected sending rate R_j for the receivers i using PI cotroller;
            }
            else
            {
            Select the maximum expected incoming rate of the next downstream node;
            }
        Construct the BCP based on the received BCP’s and the relevant case;
        Feedback it to the upstream node;
        If receivedtree[i]==1
        {
        Delete the data packets from the buffer;
        }
        Else
        {
        Maintain the data packets in the buffer until received all confirmations of the receivers;
        }
    }
}

Receiver Node Algorithm
Upon receipt of an FCP Put the data packets into the buffer; Construct the BCP based on the current case of the receiver nodes; Feedback the BCP to the upstream branch point;

A. *Merit of proposed system:*

1. data transfer rate is adjusted at the source
2. group node makes sure that the buffer occupancy stabilizes and never overflows the buffer capacity.
3. these are active and effective methods to adjust the different sending rates to different receivers, and reduce the packets loss.
4. the main proposed scheme in terms of system stability and fast response to the buffer occupancy, as well as controlled sending rates, low packet loss, and high scalability.

IV. MODULE DESCRIPTION

Design is the power to think, plan, and realize products that serve to accomplishment of any purpose. It is the process or art of defining the components, modules, interfaces, and data for a computer system to satisfy specified requirements. Here the system is divided into three modules.

- Multicast Network Configuration Module:
- Multi-rate–multicast control (MR-MCC) tree Module:
- PI controllers Module:

A. *Multicast Network Configuration Module:*

The multicast network is a connection-oriented one, which is composed of sources and destination nodes. Multicast connection and every sampling period, the multicast source issues and transmits a FCP to the downstream nodes (the branch node and destination nodes), and a BCP is constructed by each branch node based on the PI controller because PI is located at each branch point , and sent back to the source. After the multicast source receives the BCPs from the downstream nodes, it will take appropriate action to adjust its transmitting rates of multicast traffic based on the computed value of the PI controller. After receiving the data packets coming from the branch point, the receivers construct BCPs and send them back to the branch point.

B. *Multi rate–multicast control (MR-MCC) tree Module:* users who are willing to pay more to access at a higher speed. Furthermore, due to the diverse characteristics and requirements of the different receivers within a multicast group, and for greater flexibility in resource allocation, it is desirable to have multicast sessions in which different receivers receive data at different rates. This inflexibility is overcome by MR-MCC that can allocate different rates.

C. *PI controller Module:* The PI controllers are located at the next upstream branch node of the receivers. The relevant gain parameters of the PI controller are determined by the system stability. Each branch point in our scheme only receives feedbacks from the direct downstream nodes instead of all downstream nodes, thus it greatly decreases the number of feedbacks to be aggregated at one node. As a result, our scheme can avoid the so-called feedback explosion problem [24] to a great extent. The incoming flow rate of a session, at every branching point in its tree, is enforced to be the maximum of the rates that can be accommodated by its participating branches. By doing so, the sending rate at the source will eventually be the maximum of the rates that can be accommodated by the entire paths to individual receivers.

First we select the source info which is required to transfer and based on our requirement we have to select the groups. At the receiving end the concerned receiving party receives the file. Simulation results show that the proposed approach decreased time, increases the through put and performance wise it is better compared to other schemes.

V. PERFORMANCE EVALUATION

Here we pay more attention to sending multi-rates of sources, buffer occupancy, link utilization, receiving rates of routers and end-users. We assume that the link delay is dominant compared to the processing delay or queuing delay.

Simulation Model The simulation model is shown in Fig. 2. There are different receivers, groups goup1, goup2,etc.,For convenience, we group together the receivers having similar receiving rates. Thus, we select a single receiver in each group as a representative of the group.

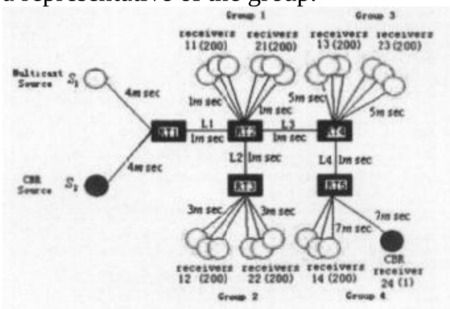

Figure2: The Simulation model

VI. CONCLUSIONS AND FUTURE SCOPE

This paper presents a theoretic analysis and design method of MR-MCC using explicit rate feedback mechanism to satisfy the different needs of the multiple users. The PI controller, whose control parameters can be designed to ensure the stability of the control loop in terms of buffer occupancy on the basis of control theory, is used in the next upstream node of the receivers to regulate the receiving rate. Relevant pseudo codes for implementation have subsequently been developed. It is clearly that the proposed MR-MCC scheme solves intra-protocol unfairness and low link utilization of SRMCC. Simulations have been carried out with a multicast source and a CBR source. Simulation results demonstrate the efficiency of our scheme in terms of the system stability, high link utilizations, fast response, scalability, high unitary throughput, intra-session fairness and inter-session fairness.

Future scope

Scalability is important for any system; various combinations of algorithms may be used for achieving better result. So in this way there is scope to the future enhancements.

REFERENCES

[1] H. W . Lee and J. W. Cho. A distributed max-min flow control algorithm for multi-rate multicast flows. In Proceedings of IEEE Global Communications Conference, pages 1140.1146, vol. 2, Dallas, Texas, USA, November 29.December 3, 2004.

[2] S. Sarkar and L. Tassiulas. Fair distributed congestion control in multirate multicast networks. IEEE/ACM Transactions on Networking, 13(1):121. 133, February 2005.

[3] L. Benmohamed and S. M. Meekov, "Feedback control of congestion in packet switching networks: The case of a single congested node," IEEE/ACM Trans. Netw., vol. 1, no. 6, pp. 693–708, Dec. 1993.

[4] N. X. Xiong, Y. He, L. T. Yang, and Y. Yang, "A self-tuning reliable dynamic scheme for multicast flow control," in Proc. 3rd Int. Conf.

Ubiquitous Intell. Comput. (UIC 2006),Wuhan, China, Sep. 3–6, pp. 351–360.
[5] L. Lao, J. H. Cui, M. Gerla, and D. Maggiorini, “A comparative study of multicast protocols: Top, bottom, or in the middle,” presented at the IEEE INFOCOM Conf., Barcelona, Spain, Apr. 23–29, 2006.
[6] A. Kolarov and G. Ramamurthy, “A control theoretic approach to the design of an explicit rate controller for ABR service,” IEEE/ACM Trans. Netw., vol. 7, no. 5, pp. 741–753, Oct. 1999.
[7] N. X. Xiong, Y. He, L. T. Yang, and Y. Yang, “A self-tuning reliable dynamic scheme for multicast flow control,” in Proc. 3rd Int. Conf. Ubiquitous Intell. Comput. (UIC 2006),Wuhan, China, Sep. 3–6, pp. 351–360.
[8] F. Blanchini, R. L. Cigno, and R. Tempo, “Robust rate control for integrated services packet networks,” IEEE/ACMTrans. Netw., vol. 10, no. 5, pp. 644–652, Oct. 2002.
[9] R. Jain, S. Kalyanaraman, R. Goyal, S. Fahmy, and R. Viswanathan, “ERICA switch algorithm: A complete description,” in ATM Forum-TM, Aug. 1996, pp. 96–1172.
[10] S. H. Lee and J. T. Lim, “Multicast ABR service in ATM networks using a fuzzy-logic-based consolidation algorithm,” Proc. Inst. Electr. Eng. Commun., vol. 148, no. 1, pp. 8–13, Feb. 2001.
[11] X. Zhang, K. G. Shin, D. Saha, and D. D. Kandlur, “Scalable flow control for multicast ABR services in ATM networks,” IEEE/ACM Trans. Netw., vol. 10, no. 1, pp. 67–85, Feb. 2002.
[12] N. Xiong,Y. He,Y.Yang, L. T.Yang, andC. Peng, “A self-tuning multicast flow control scheme based on autonomic technology,” in Proc. 2nd IEEE Int. Symp. Dependable, Auton. Secure Comput. (DASC), Indiana Univ., Purdue Univ., Indianapolis, IN, Sep. 29–Oct. 1, 2006, pp. 219–226.
[13] J.Widmer andM.Handley, “Extending equation-based congestion control to multicast applications,” in Proc. ACMSIGCOMM, San Diego, CA,Aug. 27–31, 2001, pp. 275–286.
[14] R. H. Gau, Z. J. Haas, and B. Krishnamachari, “On multicast flow control for heterogeneous receivers,” IEEE/ACM Trans. Netw., vol. 10, no. 1, pp. 86–101, Feb. 2002.
[15] L. Lao, J. H. Cui, M. Gerla, and D. Maggiorini, “A comparative study of multicast protocols: Top, bottom, or in the middle,” presented at the IEEE INFOCOM Conf., Barcelona, Spain, Apr. 23–29, 2006.