A survey on Multicast approaches in MIMO by using Explicit Rate Schemes

1. VAMSHI KRISHNA.B

2. NARENDRA REDDY.M

Abstract

In multicast networks we can distribute the data packet of information to several systems instead of having to send that packet once for every destination. By this 5, 10, or 100 machines can receive the same packet, bandwidth is conserved. Also, when you use multicasting to send a packet, you don't need to know the address of everyone who wants to receive the multicast; instead, you simply "broadcast" it for anyone who is interested.

We proposes a multicast based mimo systems to increase the wireless/wired data applications of distributed nature. So we require flow control schemes , to implement we need two integrative controllers called distributed self-tuning proportional integrative plus derivative (SPID) controller and distributed self-tuning proportional plus integrative (SPI) controller.

We also focuses on algorithm which describe the control mechanism in multicast Transmissions.

Related work

- **MIMO (multiple input, multiple output)**

  MIMO (multiple input, multiple output) is an antenna technology for wireless communications in which multiple antennas.

  802.11n

  802.11n is an addition to the 802.11 family of standards. The goal of 802.11n is to increase wireless local area network (WLAN) speed A smart antenna is a digital wireless communications antenna system that takes advantage of diversity effect at the source

- **Long Term Evolution (LTE)**

  Long Term Evolution (LTE) is a 4G wireless broadband technology developed by the Third Generation Partnership Project (3GPP)

- **SISO (single input, single output)**

  SISO (single input, single output) refers to a wireless communications system in which one antenna is used at the source

- **MISO (multiple input, single output)**

  MISO (multiple input, single output) is an antenna technology for wireless communications in which multiple antennas are used

- **SIMO (single input, multiple output)**

SIMO (single input, multiple output) is an antenna technology for wireless communications in which multiple antennas are used

Multicast is communication between a single sender and multiple receivers on a network. Typical uses include the updating of mobile personnel from a home office and the periodic issuance of online newsletters. Together with anycast and unicast, multicast is one of the packet types in the Internet Protocol Version 6 (IPv6).

Multicast is supported through wireless data networks as part of the Cellular Digital Packet Data (CDPD) technology.

Multicast is also used for programming on the MBone, a system that allows users at high-bandwidth points on the Internet to receive live video and sound programming. In addition to using a specific high-bandwidth subset of the Internet, Mbone multicast also uses a protocol that allows signals to be encapsulated as TCP/IP packet when passing through parts of the Internet that can not handle the multicast protocol directly.

EXISTING SYSTEM

Without an adequate flow control scheme being implemented in a multicast tree, the incoming traffic to a bottleneck link might be much more than the outgoing link capacity, which could subsequently cause the buffer to overflow, and cause excessive queuing delay or even deadlock in certain nodes. There are many flow schemes handling unicast transmissions efficiently, and they were formulated as a discrete-time feedback control problem with delays. This control-theoretic approach to explicit rate control for available bit rate (ABR) service was further analyzed and verified using a real-network test bed. All these methods are efficient in rate allocation and flow control for unicast transmission. Unfortunately, multicast flow control is much more sophisticated than that of unicast, due to the complexity of multicasting mechanism.

Algorithm Used:

1. Distributed ER allocation algorithm.

In this algorithm, flow controllers regulate the source rate at a multicast tree, which accounts for the buffer occupancies of all destination nodes. The proposed control scheme uses a distributed self-tuning proportional integrative plus derivative (SPID) controller or uses a distributed self-tuning proportional plus integrative (SPI) controller. The control parameters can be designed to ensure the stability of the control loop in terms of source rate. We further show how the control mechanism can be used to design a controller to support multipoint-to-multipoint multicast transmission based on ER feedback. System stability criterion is derived in the presence of destination nodes with heterogeneous RTTs.

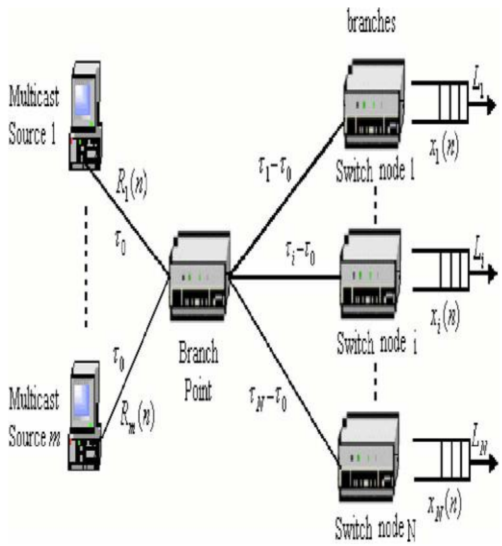
2. SPID and SPI Algorithms

Each branch point of the multicast tree replicates each data packet and FCP from its upstream node to all its downstream branches. The downstream nodes return their congestion information via BCPs to the parents through the backward direction once they receive FCPs. Assume that congestion never happens at the router connected with the sources; hence, these two can be consolidated into one node, which is true in most cases in real networks.

Proposed System:

We proposed 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 senders to a set of receivers. Unfortunately, the widely used multicast transport protocols, which are layered on top of IP multicast, can cause congestion or even congestion collapse if adequate flow control is not provided. Flow control thus plays an important role in the traffic management of multicast communications.

Several multicast flow approaches have been proposed recently. One class of them adopts a simple hop-by-hop feedback mechanism, in which the feedback, i.e., backward control packets (BCPs), from downstream nodes are initially gathered at branch points, and then are transmitted upward by a single hop upon receipt of a forward control packet (FCP). This kind of manipulation can be carried out on the basis of the tree structure in a multicast transmission. These schemes then introduce another problem of slow transient response due to the feedback from "long" paths. Such delayed congestion feedback can cause excessive queue buildup/packet loss at bottleneck links.



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 sending rates, and reduce the packets loss.

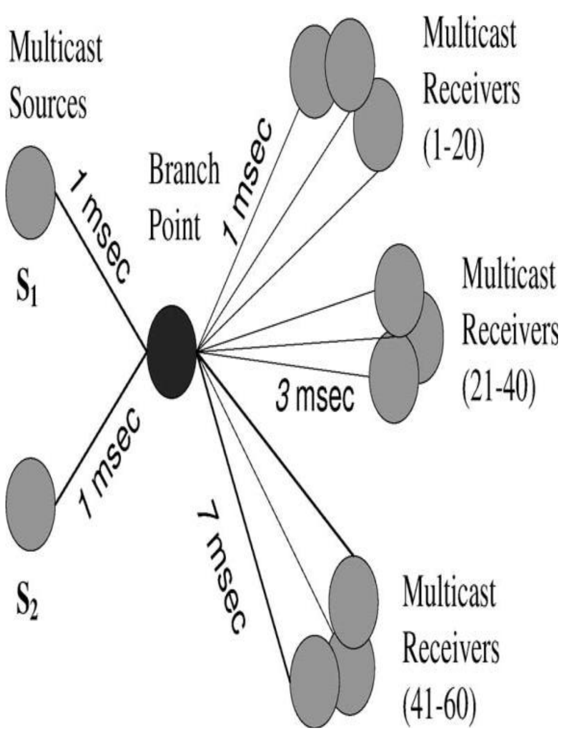
4. a lot of approaches use queue schemes to solve congestion control problems
5.The main proposed scheme in terms of system stability and fast response to the buffer occupancy, as well as controlled sending rates, low packet loss, and high scalability.

Approaches

1. 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 downstream node 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 SPID controller. After receiving the data packets coming from the branch point, the receivers construct BCPs and send them back to the branch point.

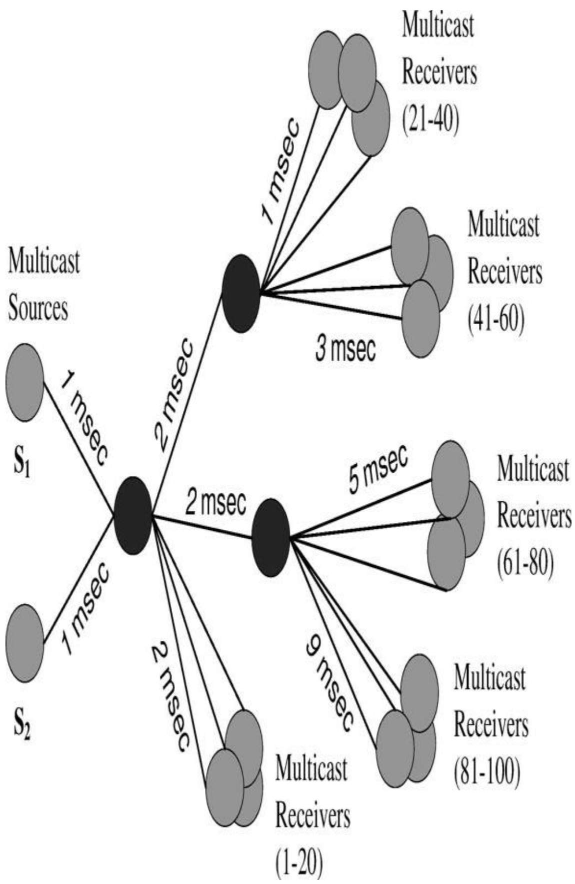
2. Multirate–multicast control (MR-MCC) tree Module:



we process the nodes that have small differences of time delay and sending rate together. Then we unify the time delay and sending rate. Since the situation of every node in each group (about 20 receivers) is similar, we only choose one node from each group as a representative. We assume that the link delay is dominant compared to the other delays, such as processing delays and queuing delay. the multicast source S1 sends data packets at 0 ms and the multicast source S2 starts to send data packets at 1000 ms in the simulation time; then the joining of S2 enhances the network dynamic behavior, and also demonstrates the efficiency of the SPID and SPI schemes. In simulation 2 (see Fig), there are more receivers and longer delay than in model 1, and we set appropriate parameters to enable system stability.

3. SPID and SPI controllers Module:

The control parameters of the SPID and SPI controllers can be designed to ensure the stability of the control loop in terms of buffer occupancy and adjust automatically, depending on the network load. This subsequently means that the schemes provide the least packet loss in steady state. Relevant pseudo codes for implementation have been developed, and the paper shows how the two controllers could be designed to adjust the rates of data service. Simulations have been carried out with wireless and wired multipoint-to-multipoint multicast models.



Source Algorithm

- Upon every T sampling period
  - Transmit data streams including FCP;
- Upon receipt of a BCP from its downstream
  - Compute the sending rate based on the BCP using SPID/SPI controller;
  - Adjust the transmitting rates based on computed sending rate.

Router Algorithm

Variables:
$Multicasttree[i] = 1(0)$;
// the i^{th} router receives (doesn't receive) FCP or BCP control packet;
$Receivertree[j] = 1(0)$;
// the j^{th} router receives (doesn't receive) confirmations of all receivers;
If $Multicasttree[i] = 1$

- If the packet is an FCP
  - Put the data packet in the buffer;
  - Copy the data including FCP;
  - Multicast them to the downstream nodes;
- If the packet is a BCP
  - Construct the BCP based on the received BCPs;
  - Feed it back to the upstream node;
  - If $Receivertree[j] = 1$
    - Delete the data packets from the buffer;
  - If $Receivertree[j] = 0$
    - Maintain the data packets in the buffer until all confirmations of the receivers are received;

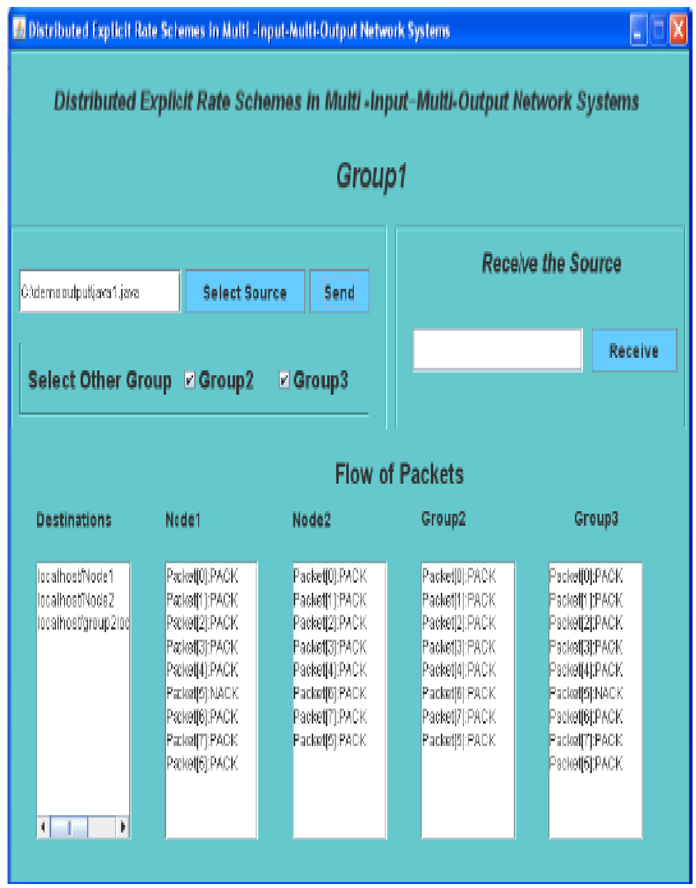
Receiver Algorithm

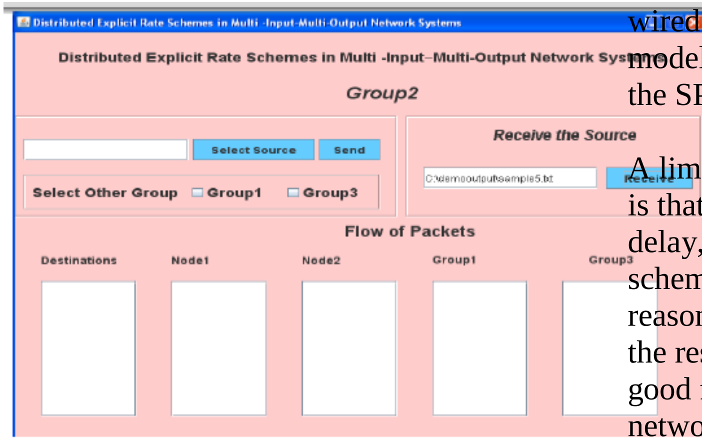
- Upon receipt of an FCP
  - Put the data packets into the buffer;
  - Construct the BCP based on the current flow case of the receiver;
  - Feedback the BCP to the upstream routers.

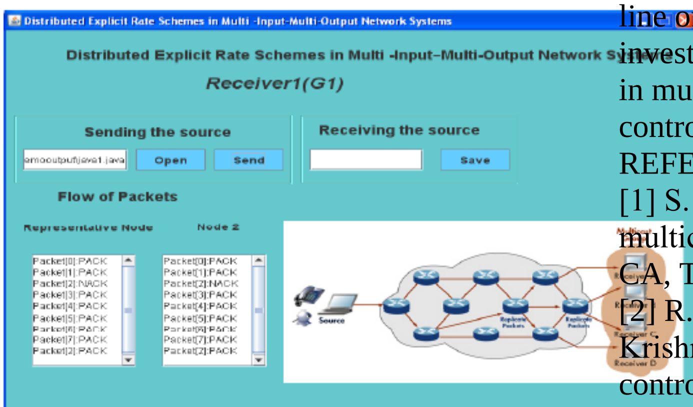
4. Forward control packet (FCP) Module:

Forward control packet (FCP). This kind of manipulation can be carried out on the basis of the tree structure in a multicast transmission. The main merit of these methods lies in the simplicity of the hop-by-hop mechanism. First-in first-out (FIFO) queue to multiplex all flows traveling through the outgoing link. Assume that congestion never happens at the router connected with the sources; hence, these two can be consolidated into one node, which is true in most cases in real networks.

Test results







CONCLUSION

In this paper, as we presented two novel wireless and wired multicast schemes, called SPID and SPI schemes, using an explicit rate feedback mechanism to design a controller for regulating the source rates in wireless and wired multipoint-to-multipoint multicast networks. The control parameters of the SPID and SPI controllers can be designed to ensure the stability of the control loop in terms of buffer occupancy and adjust automatically, depending on the network load. This subsequently means that the schemes provide the least packet loss in steady state. Relevant pseudo codes for implementation have been developed, and the paper shows how the two controllers could be designed to adjust the rates of data service. Simulations have been carried out with wireless and wired multipoint-to-multipoint multicast models to evaluate the performance of the SPID and SPI controllers.

A limitation of the explicit rate schemes is that if the network has a larger transfer delay, then the effect of the control schemes becomes weak. A possible reason is that a larger delay makes the response time too long, which is not good for an applicable network. Our further research along this line of study would investigate TCP-friendly related issues in multicast congestion control.

REFERENCES

[1] S. Deering, “Host extensions for IP multicasting,” Stanford Univ., Stanford, CA, Tech. Memo. RFC1112, Jan. 1989.
[2] 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.
[3] L. Roberts, “Rate based algorithm for point to multipoint ABR service,” in *ATM Forum Contribution 94–0772*, Sep. 1994.
[4] K. Y. Siu and H. Y. Tzeng, “On max-min fair congestion control for multicast ABR services in ATM,” *IEEE J. Sel. Areas Commun.*, vol. 15, no. 3, pp. 545–556, Apr. 1997.
[5] H. Saito, K. Kawashima, H. Kitazume, A. Koike,M. Ishizuka, and A. Abe, “Performance issues in public ABR service,” *IEEE Commun. Mag.*, vol. 34, no. 11, pp. 40–48, Nov. 1996.
[6] X. Zhang andK.G. Shin, “Statistical analysis of feedback synchronization signaling delay formulticast flowcontrol,” in *Proc. IEEEINFOCOM*,Apr.

2001, pp. 1152–1161.
[7] Y. Z. Cho, S. M. Lee, and M. Y. Lee, "An efficient rate-based algorithm for point-to-multipoint ABR service," in *Proc. IEEE GLOBECOM*, Nov. 1997, pp. 790–795.
[8] W. Ren, K. Y. Siu, and H. Suzuki, "On the performance of congestion control algorithms for multicast ABR service in ATM," presented at the IEEE ATM Workshop, San Francisco, CA, Aug. 1996.
[9] D. DeLucia and K. Obraczka, "Multicast feedback suppression using representatives," in *Proc. IEEE INFOCOM*, 1997, vol. 2, pp. 463–470.
[10] 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.
[11] 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.
[12] 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.
[13] 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.
[14] F. Blanchini, R. L. Cigno, and R. Tempo, "Robust rate control for integrated services packet networks," *IEEE/ACM Trans. Netw.*, vol. 10, no. 5,

Authors Profile

1.Vamshi Krishna. B
Assoc. Professor, dept. of CSE,
Mallareddy College Of Engineering And Technology ,Hyd

2.Narendrareddy M
M.Tech student dept. of CSE,
Mallareddy College Of Engineering And Technology ,Hyd