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A Controlled Approach for Multicast Routing Protocol Using Branching Router

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Abstract: ***Traditional multicast routing protocol faces many issues and challenges. To deal with it many approaches differentiating the branching routers from the non-branching ones have been introduced. But these schemes that are proposed have many issues concerning to multicast management, inefficient tree construction and excessive lookups during forwarding process of unicast and multicast packet. This paper is an improvement over novel branching-router-based multicast routing protocol. Here a router is selected to share MC's functionality, hence the overhead on MC is reduced resulting the reduction in join latency.***

Keywords: Branching router, Multicasting, NMB, REUNITE, SEM..

1. Introduction

Multicast is a term associated with network which supports sending of a single datagram to multiple hosts on a network. Multicasting was proposed by Deering in 1988. Multicast uses network infrastructure efficiently by requiring the source to send a packet only once, even if it needs to be delivered to a large number of receivers. The nodes in the network take care of replicating the packet to reach multiple receivers. The IP Multicast architecture is completed by group addressing and routing protocols. Internet Protocol (IP) multicast is a technology that conserve bandwidth and thus reduces traffic by delivering a single stream of information to multiple recipients simultaneously.

The multicast tree is constructed between routers and each router holds forwarding-state information for forwarding data. However in traditional multicast routing protocols, even if the router is not a member of the multicast group it maintains the Forwarding-state information to forward multicast packet in the group. The complications arises when a router would be on multiple trees, thus storing such information is big. The forwarding-state information for each multicast group may change. So scalability is a major concern.

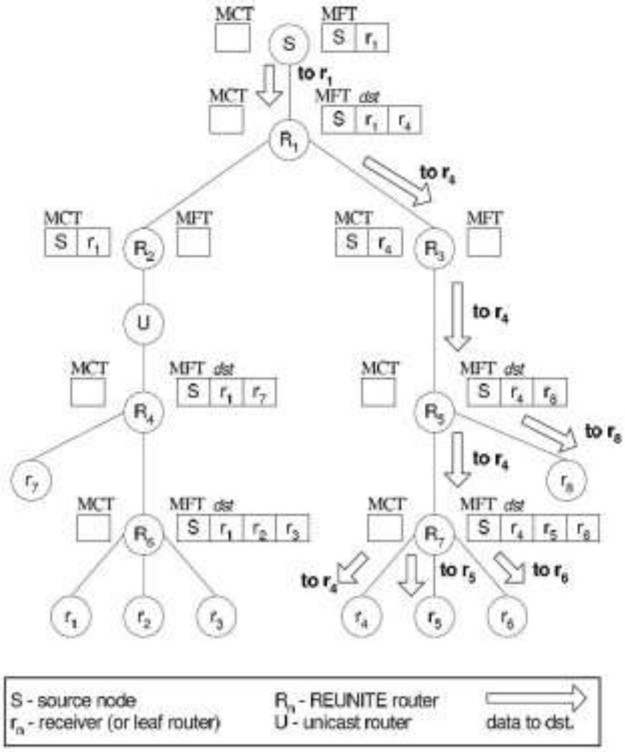
In several recent multicast routing protocols, multicast tree is identified by its branching points (BPs) in which multicast data is delivered from one BP to another using native unicast. We call these protocols BP-based protocols. A BP in a multicast tree is a router, which forwards multicast data packets to multiple next-hop routers. The main motivation here is that in a typical sparse multicast distribution tree, the majority of routers are relay routers, which forward incoming packets to an outgoing interface. In BP-based protocols, only BPs keep MFT (Multicast Forwarding Table) entries. All non-BPs forward multicast data packets using unicast forwarding scheme. As a result, these protocols have low memory requirements compared to the traditional approaches.

2. Related Works

Researches are always being conducted to improve the branch router based multicast protocol. Some of the well-known approaches are described as follows:

2.1 REUNITE (REcursive UNIcast TrEes)

I.Stoica et.al (2000) proposed a new multicasting protocol known as REUNITE [1]. REUNITE perform multicast distribution established on the unicast routing framework.. REUNITE's primary inspiration is that in classic multicast trees, the majority of routers simply forward packets from one incoming interface to outgoing interface, hence less number of routers are branching nodes. So the aim is to differentiate multicast routing information in two tables:
a Multicast Control Table (MCT) and a Multicast Forwarding Table (MFT) Non-branching routers keep group information in their MCT, and branching routers keep MFT entries which are used to create periodic packet copies as to reach all group members. REUNITE identifies an exchange by a <S,P > tuple, where S is the unicast address of the source and P is a port number allocated by the source. Class-D IP addresses are not used in reunite.



. **Figure 1:** REUNITE tree formation.

REUNITE uses two message types: *join* and *tree*. *Join* messages travel from the receivers to the source i.e upstream, as *tree* messages are Periodically sent by the source to refresh soft-state of the tree. Only the branching nodes for the group keep entries in their MFT. The control table, MCT, is not used for packet forwarding.

2.2 HBH (Hop-By-Hop)

L.H.M.K. Costa et.al (2001) proposes a little better multicast protocol known as Hop-By-Hop[2] multicast protocol. This multicast routing protocol tries to eliminate some drawbacks of REUNITE. First, HBH employs class D IP addresses for multicast channels instead of unicast addresses. Second, the MFT in HBH stores the address of the next BR instead of the address of a receiver (except for the BR nearest the receiver). Third, HBH tries to solve the asymmetric routing problem present in REUNITE. A multicast channel in HBH is denoted by < S,G >, where S is the unicast address of the source and G is a class-D IP address. This helps the protocol to be compatible with IP multicast. HBH has three message types: Join, Tree, and Fusion. The Join messages are timely sent by the receivers in the direction of the source and refresh the forwarding state (MFT entry) at the router where the receiver joined. A BR joins the group itself at the next upstream BR (uBR). The source periodically multicasts a Tree message that refreshes the rest of the tree structure. The Fusion messages are sent by potential BRs and construct the distribution tree together with the Tree messages.

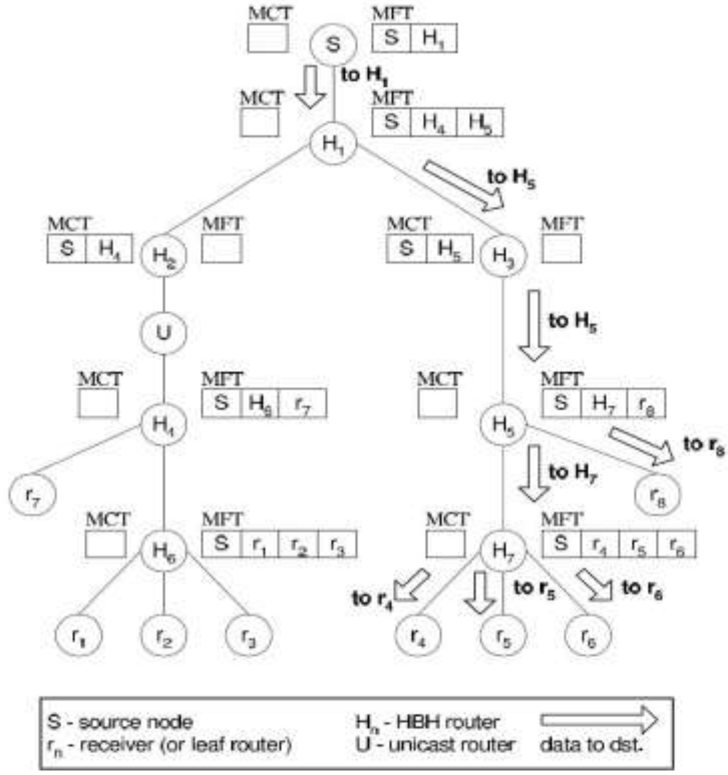


Figure 2: HBH tree formation.

2.3 SEM (Simple Explicit Multicast)

Boudani et.al (2003) proposed Simple explicit multicast[3] protocol. This is one of the Branch router-based method which produces low tree construction complexity than REUNITE and HBH. It uses the source-specific channel address allocation, employs data distribution using unicast trees and decreases the forwarding states in non-branching node routers. The BRANCH message contains the list of receivers inserted in its packet header. The source then parses the header, partitions the destinations based on each destination's next hop, and send the BRANCH message to each of the next hops. The role of the BRANCH message is to discover routers acting as branching nodes in the. multicast tree. The SEM header also contains the previous hop branching router field (with initial value the source address). This produces limitation in packet size that restricts the number of receivers supported. The multicast tree is constructed when a new member joins the session or one of the existing members leaves the session. This drawback severely limits SEM applications.

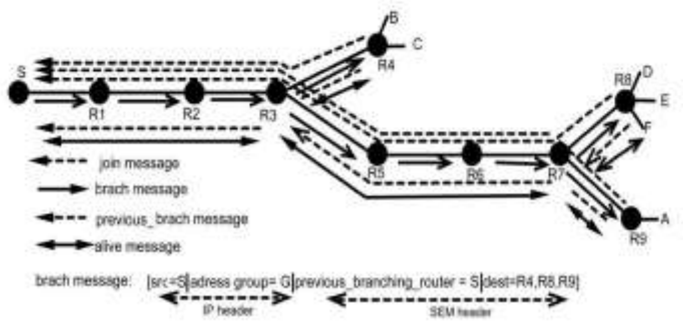


Figure 3: SEM tree formation.

2.4 NBM (Next Branch Multicast)

M. Bag-Mohammadi et.al (2005) proposed Next Branch Multicast [4]. This is another Branching router-based protocol that creates the multicast distribution tree in the forward direction. BPs failure fault-detection and restore mechanism are used here. NBM do not preserve any type of control state in non-branching routers. The NBM protocol consists of two different parts: tree construction and tree maintenance. The tree construction utilizes a basic and effective method to differentiate BPs of RT (reduced tree). It utilises Build message to get the related BP of the new receiver. The tree construction process of NBM does not need to preserve MCT or any other control state in RNs and BPs. It builds tree gradually only with help of the MFT content. The tree maintenance process of NBM uses a novel technique to find and restore failures of BPs.

In NBM, every BP refreshes its children information timely. All children who miss three consecutive refresh messages will detect the BP failure. Then, the NBM repair mechanism locally restores the tree and finds a new BP (or new BPs) for the orphaned receivers. For tree construction mechanism NBM has six protocol messages namely Join, Leave, Build, Unlock, Replace and Parent. The Join message of a new receiver always reaches the source without any obstruction by routers in-between. Build message is used to detect the associated BP of the new receiver. The Unlock message is used to maintain consistency of the multicast tree against hazardous race conditions. Replace is sent in the opposite direction of the Build message. Parent message is sent timely by every BP (including sender) toward each child in its MFT. Leave message is sent by the children BP to the previous BP when they don't receive parent message.

2.5 BRMM (Branching-Router Based Multicast)

Zhiwei Yan et.al (2013) suggested Branching-Router Based Multicast protocol[5]. In this protocol a management entity known as Multicast controller (MC) is introduced to the multicast session and a Branching Point based Multicast routing protocol (BPM) is used for constructing multicast tree. At first, the MC should be able to process the request from the source and receiver for address management, group membership management and multicast source authentication for multicast service. When a new receiver wants to join the multicast group, the AR(Access Router is the one which is connected to the receiver directly) of the receiver demands with the MC for the new receiver's authentication and "MI (Multicast source IP)" mapping query. When the receiver terminates the multicast service, the AR of the receiver reports the leaving state and accounting information to the MC. Hence in this protocol MC exhibits a crucial role. It supports mobility very well since the join latency is reduced. Therefore, the packets are received very fast.

3. Performance Analysis

The performance was analyzed and compared using general key features of these methods. This is shown in table I

Table 1: Comparison of Multicast Routing Protocols

Protocol	*Memory Usage*	*Groupsize*	*Chances to Survive BP Failure*	*Construction Complexity*
REUNITE	High	Large	Low	High
HBH	High	Large	Low	High
SEM	Low	Small	Low	High
NBM	Low	Large	Average	High
BRMM	Low	Large	High	Low

4. Proposed Work

In this section a slightly more controlled routing protocol is discussed. In Branching-Router Based Multicast Routing Protocol, as already discussed, MC is given more control on the overall system. The Branching-Router Based Multicast Routing Protocol introduced MC as an authenticating entity. But still it lacks control in certain areas.

In this protocol, when an authorised receiver sends a join message to the source through the BR, instead of sending data packets to the receivers right away, BR firsts needs the permission of MC to do that. MC is the one that authenticates and provides new id's to the receiver's, so when BR sends a request to MC, MC compares the receivers to the list of authorised receivers. Only after the permission from the MC is received, the BR sends the data packets to the receiver before the tree is created, after the tree has been created the data packets are directly sent from the source to the receiver, so the intermediate branching router do not have to take permission of the MC to pass data packets along the path.

This modification makes the system more controlled and reliable, but it also increases the burden on MC. Since each system has only one MC, the chances of MC overworking are more. As the number of receiver increases the query increases and thus MC finds it difficult to process them all and overhead occurs.

To avoid this, the newly suggested protocol assigns a stress managing router (SMR). This router is introduced so that it can share the burden of the MC and can combat the overhead created. This router is selected from the many routers that reside in the system. To select this router, a new algorithm is implemented. This algorithm is known as SMR algorithm. This algorithm is repeated whenever there is overhead on MC.

Each SMR is selected in such a way that a tree has only one SMR.

4.1 Selecting SMR using SMR Algorithm

1. Check if Overhead =1 . If true then generate broadcast message from MC stating require of SMR.
2. Calculates the number of neighbour routers connected to it. Each router sends its calculated neighbours to MC in unicast message.
3. The MC receives all the neighbour count and the highest neighbour count is selected as SMR.
4. MC sends a unicast message to highest count MR , stating it as SMR, and tells to make all its neighbours, neighbour count = 0.
5. SMR sends broadcast declaring itself as nearest stress managing MC to other routers.
6. SMR sends all its neighbour a unicast message stating neighbour count = 0. All its neighbour make their neighbour count = 0.
7. Now other routers send the request to newly elected SMR for creation & authentication purpose.
8. Go to step 1.

5. Result and Analysis

The project is implemented using NS2. Here nodes are dynamic. In the simulation number of multicasting router is taken as 50 and the receiver node as 6. Initially the source and the receiver have to get authentication from the MC. MC further handles all the process in the network. But since each system has only one MC, at a certain point MC starts to overwork. The proposed system reduces overhead on the MC using SMR. Here the efficiency of the system is calculated using MC overhead and join latency as parameters.
After the modification is implemented it is found that the control over the BR’s in the proposed method is slightly increased, because in proposed method before sending any data packet to the newly joined receiver, BR has to ask for MC’s authentication to give the data packet.
Overhead in the existing method is higher than the proposed method, because in existing method, MC is a single entity for authentication. After the selection of SMR, the further authentication process is done at SMR. And graph is plotted according to this new implementation. Graphical result in Fig 4 shows that, in proposed method the overhead is reduced. Graphical result in Fig 5 shows that join latency is reduced in the proposed system.

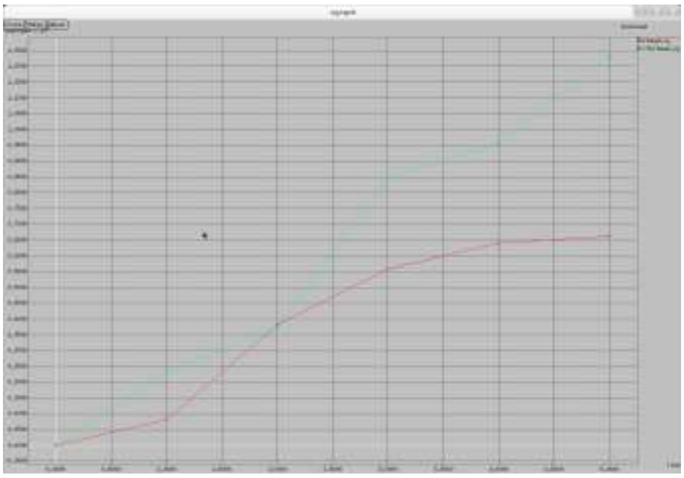


FIGURE 4: MC overhead comparison

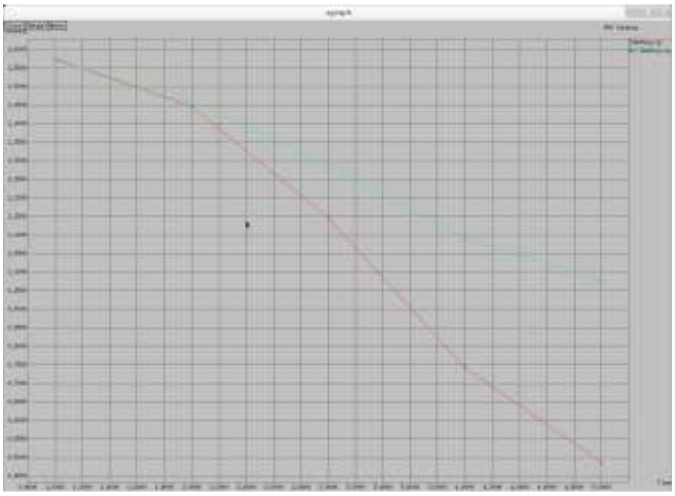


FIGURE 5: Join latency comparison

6. Conclusion

With the growing popularity of multicast applications, many field uses multicast services such as video conferencing, online gaming, software distribution and so on.. The controlled approach for multicast routing protocol using branching router, uses an efficient method to construct multicast tree and deliver multicast packets with mobility support. Here the BR has to check with the MC to send data to newly joined receiver. The MC has been introduced to make the multicast more controllable, secure, and manageable. But as the number of receiver increases tasks of MC increases and overhead is occurred. The suggested system tries to eliminate by providing a stress managing router to share the work load.

REFERENCES

[1] I. Stoica, T.S.E. Ng, and H. Zhang, “REUNITE: A Recursive Unicast Approach to Multicast,” Proc. IEEE INFOCOM, pp. 1644-1653, Mar. 2000.

[2] L.H.M.K. Costa, S. Fdida, and O. Duarte, “Hop by Hop Multicast Routing Protocol,” Proc. ACM SIGCOMM, pp. 249-259, Aug. 2001.

[3] A. Boudani and B. Cousin, “SEM: A New Small Group Multicast Routing Protocol,” Proc. Int’l Conf. Telecomm. (ICT), pp. 450-455, Feb. 2003.

[4] M. Bag-Mohammadi and N. Yazdani ,“Next Branch Multicast (NBM) Routing Protocol,” Computer Networks, vol. 49, no. 6,pp. 878-897, 2005.

[5] Zhiwei Yan, Jong-Hyouk Lee, Sean Shen, and Chunming Qiao (2013), “Novel Branching-Router-Based Multicast Routing Protocol with Mobility Support” IEEE Transactions on parallel and distributed system, vol. 24, No. 10

[6] Zhiwei Yan, Jong-Hyouk Lee, Sean Shen, and Chunming Qiao (2013), “ SUPPLEMENTARY PAPER : Novel Branching-Router-Based Multicast Routing Protocol with Mobility Support” IEEE Transactions on parallel and distributed system.