

Tech-Topic Analysis

K. Almeroth, "The Evolution of Multicast: From the MBone to Inter-Domain Multicast to Internet2 Deployment," IEEE Network Special Issue on Multicasting, January/February 2000.

In order to discuss this paper, some of the commonly used abbreviations must be defined.

Abbreviations:

AAP - Address Allocation Protocol

AS - Autonomous System

BGMP - Border Gateway Multicast Protocol BGP - Border Gateway Protocol CBT - Core Based Trees DVMRP - Distance Vector Multicast Routing Protocol IETF - Internet Engineering Task Force MAAA - Multicast Address Allocation Architecture MAAS - Multicast Address Allocation Server MADCAP - Multicast Address Dynamic Client Allocation Protocol MASC - Multicast Address-Set Claim MBGP - Multiprotocol Extensions to BGP4 MBone - Multicast Backbone MSDP - Multicast Source Discovery Protocol RAMA - Root Addressed Multicast Architecture RP - Rendezvous Point RPF - Reverse Path Forwarding RTP - Real Time Protocol PIM - Protocol Independent Multicast SA - Source Active

This paper does not produce a new problem in the field of multicast nor does it produce a novel solution to a known problem in the field of multicast. However, this paper lays out the history of multicast, different proposed protocols, problems in its implementation, different solutions to its problems, and how it is deployed in the real world. The paper does all these things in an organized and easy to follow manner. Compared to other papers, this paper does a superb job in making sure the reader has a good understanding of the topics covered. The author outlines the remainder of the article at the end of the introduction. This allows the reader to know what to expect.

The author also reiterates the major points at the end of each section. This ensures that a reader with little background knowledge who may be confused by the small details still understands the point of each section.

The author begins with a brief introduction of multicast. He explains how multicast is a hot topic due to the amount of research being done in the field as well as the demand of the feature by vendors. He lays out two concerns for multicast. One is that the deployment of multicast has been relatively slow. The other is that multicast requires that the network maintain more state in routers. I would have liked to see the author go more into why the deployment has been so slow.

After the introduction, the paper introduces the standard IP multicast model, the MBone, routing protocols and some problems of the MBone. In describing the standard IP model, the paper points out that the model neglects information about routing. The first multicast deployment, known as the MBone, was routed using DVMRP. DVMRP used the broadcast-and-prune method to create a multicast tree (called a reverse shortest path tree). Broadcast-and-prune protocols (aka dense mode (DM) protocols) work best when the network has a lot of group members. The paper points out a very important point about DM protocols. This is that every router must keep state information for each source. Therefore, if the network is not densely populated then there will be a waste of bandwidth. With

growth in the MBone, it went from DVMRP routing to built in multicast capability. Next the author briefly describes two more DM protocols, which are MOSPF and PIM-DM.

Following the DM protocols, the paper then goes over two sparse mode (SM) protocols. He explains a little bit about the CBT protocol and goes more in depth with the PIM-SM protocol which is more widely used.

After describing examples DM and SM protocols, he states some advantages that SM protocols have over DM protocols. Two of his examples are that SM protocols better deal with scalability and that in SM protocols traffic only crosses specific links. He points out that SM has some disadvantages as well. However, he states different ways that SM deals with the disadvantages. The paper seems biased towards SM protocols because it does not attempt to explain how DM protocols deal with their problems and for every SM protocol problem there is a solution to it explained. There are not only problems in the protocols but also problems with the MBone. With more and more growth, the MBone has problems dealing with scalability and manageability.

Interdomain multicast began as a way to deal with scalability and manageability because the MBone could not. With the idea of interdomain multicast came solutions to how to deal with interdomain multicast routing. The paper discusses a short term solutions known as MBGP/PIM-SM/MSDP. The advantage to this short term solution is that it is functional in a time where a functional solution is needed and the disadvantage is that it may have scalability issues. Long term solutions either try to create a good solution based off the standard IP model or they try to create a new model. The author discusses long-term solutions such as BGMP, MASC, GLOP, RAMA, and express and simple multicast.

The end of the paper discusses the deployment of multicast in the Internet and Internet2. Interdomain multicast continues to increase while intradomain multicast steadily decreases. The Internet and Internet2 have different approaches to multicast. It is hard to measure the success of multicast in both deployments.

This paper had a strong contribution to multicast by bringing a lot of information about multicast together. New graduate students who are interested in research in multicast can read this one paper as a great introduction to the field.