Reading Report #8
Paper: Multicast Routing in Datagram Internetworks and Extended LANS
Student: Shuo Yang

The paper mainly presents three efficient routing algorithms for multicasting in the Internet and extended LANs by modifying the existent unicast protocols such as distance vector and link-state protocols.

I would like to argue that the design of such multicasting algorithms kind of violates the end-to-end principle raised in the "End-to-end arguments in system design" paper. The end-to-end principle states that in a general-purpose network, application-specific functions ought to reside in the end hosts of a network rather than in intermediary nodes, given that these functions can be implemented completely and correctly in the end hosts.

First, the functionality of one-to-many or many-to-many delivery over the network can be implemented completely on the end hosts without resorting to the network itself by using repetitive unicasting. Doing this will put too much additional traffic to the network, but it simplifies the network itself and puts the multicast functionality to the end users, they may implement it in anyway they want based on the unicast, thus stick to the principle of end-to-end argument.

On the other hand, for the algorithms proposed by the paper, the network itself has to keep some states in order to achieve efficient multicasting, thus the modified distance vector or link-state protocols are not stateless protocol anymore. The main trade-off made by the paper is low delay of joining in or deliverying to a multicast group vs. increased cost in router state maintenance. For example,

1. For the basic algorithm used with LAN bridges, a router involved in multicasting needs to maintain a table of multicast records and periodically increment ages of multicast table records, and expire them. This lowers the delay of joining and leaving a multicast group, but at the cost of increased bandwidth used for periodic membership reporting, which is used to construct the tables, and of course, the additional state information the router maintained for multicast table records.

2. For the distance vector multicasting, a router needs to deal with membership reports and keep track of a single closest "parent" router for each link relative to a multicasting source S. It needs to transit, store and process non-membership reports also.

3. For link-state multicasting, a router needs to consider multicast membership as part of the link "state" as well.

Thus, this paper seems to serve as a counter-argument to the end-to-end argument. Apparently, multicasting is important and indeed we need efficient and scalable multicasting protocols. However, completely replying on end hosts to implement multicasting does not sound as a good idea. We need strong and robust network design to achieve these goals.