

# Multicast Routing in Datagram Internetworks and Extended LANs

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An efficient multicast facility provides packet delivery to group of hosts at a lower network and host overhead than broadcasting all hosts or unicasting to each host in a group. Multicasting is an important issue in distributed systems, popular protocol suites and distributed applications.

Multicast is well supported by LANs such as Ethernet. We are interested in extending current routing algorithms for internetworks and extended LANs to support multicast. A multicast packet should be delivered to each member of destination group with probability and delay very close to that of a unicast packet sent to that same member. The multicast facility should minimize the join latency.

Bridges typically restrict all packet traffic to a single spanning tree. Bridges can learn group addresses if group members periodically issue packets membership packets. Membership reports traverse all bridges in the tree and set appropriate outgoing-branches on them. The main cost of this multicasting algorithm is the overhead of the periodic membership reports. To reduce this cost, we change the algorithm in such a way that only a member of a group generates membership reports for that group in that LAN.

There are variant multicast algorithms for Distance Vector routing such as RPF, RPB, TRPB and RPM. In RPF, a router forwards a broadcast packet originating at source S if and if it arrives via the shortest path from the router back to S. RPF is really a broadcast algorithm and its major drawback is that any single broadcast packet may be transmitted more than once across any link. RPB eliminates duplicate transmissions by defining child links and parent routers. TRPB prunes shortest-path broadcast tree rooted at a specific source to improve multicasting. This could be accomplished by requiring members of a group to send membership reports back up the broadcast tree towards that source. RPM provides on-demand pruning. When a source first sends a multicast packet, it traverses shortest-path broadcast tree to all routers. A router that hasn't any member for that group in its child links sends a NMR packet back to the router that is one hop towards the source and is pruned from the tree.

It's easy to extend the link-state routing algorithm to support shortest-path multicast routing. Simply have routers consider as part of the state of a link the set of groups that have members on that link. Thus, any router can compute shortest-path multicast tree from any source to any group using Dijkstra's algorithm.

In hierarchical multicast routing one subdomain is treated as a single link in a higher level domain. This technique helps to reduce the cost of multicast algorithms in internetworks or extended LANs with large number of links.