

Abstract

The demand for multicast capabilities in IP networks is growing very rapidly. New applications that take advantage of IP Multicast are being introduced constantly. Therefore, IP Multicast is regarded as one of the most important technologies in IP networks today.

This dissertation focuses on the simulation and performance evaluation of IP Multicast using Protocol Independent Multicast – Dense Mode (PIM-DM) as the multicast routing protocol. The simulation is executed in a network simulator named UMJaNetSim, where custom components are built in order to simulate IP Multicast. First, the advantages and applications of IP Multicast, multicast addressing, Internet Group Management Protocol (IGMP), multicast forwarding algorithms, multicast routing protocols, computer simulation and objects in UMJaNetSim are studied. Next, the IGMP and PIM-DM protocols are implemented and integrated into the simulator. The simulation is carried out on point-to-point links and in a non-dynamically changing unicast routing environment. The simulated multicast applications used in the simulation environment involve only one-to-many communication pattern.

The performance of simulation of IP Multicast using PIM-DM in dense and sparse distributions of multicast membership is analyzed. These include join latency, traffic concentration and protocol overhead. It is found that membership distribution could affect the performance of IP Multicast. Simulation results show that sparsely distributed multicast members have lower join latency while densely distributed multicast members have lower traffic concentration and smaller protocol overhead.