SUMMARY OF Ph.D. DISSERTATION

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Title

A Study on an Integrated Protocol for Host and Network Mobility in IPv6

Abstract

MIP6-NEMO, a network mobility protocol based on Mobile IPv6, has several fundamental problems such as routing redundancy, large header overhead, and single point of failure. LIN6-NEMO, a network mobility protocol based on LIN6, does not have these problems. However, it has large signaling overhead and does not support communication with an ordinary IPv6 node. The problems of LIN6-NEMO were solved by two approaches: (1) HLIN6-NEMO that employs hierarchical management and (2) χLIN6-NEMO that employs packet forwarding. However, HLIN6-NEMO has large signaling overhead at handover and χLIN6-NEMO needs a large address block for each Mapping Agent.

This dissertation proposes νLIN6, an integrated mobility protocol that supports both host mobility and network mobility. It supports host mobility in optimal routing without header overhead. νLIN6 introduces the Mapping Agent (MA) that forwards packets destined for the mobile network and conceals the movement of the mobile network from the correspondent nodes. When the MA forwards a packet, it rewrites the network prefix of the destination address. With this mechanism, νLIN6 can avoid sending a lot of Location Update Messages upon handover. νLIN6 adds an extension header in 24 bytes at the source node to avoid header overhead by tunneling. There is no limitation of location and the number of the Mapping Agents so that νLIN6 is tolerant to failure of the Mapping Agent. Furthermore, νLIN6 provides IPv6 nodes and Local Fixed Nodes with transparent communication by introducing the concept of the Home Network, the Primary Mapping Agent, and new DNS entries.

νLIN6 is superior to MIP6-NEMO with respect to header overhead, signaling overhead, and fault tolerance. Although packets in νLIN6 are delivered through a redundant route, it achieves movement of the mobile network with minimum signaling cost and accomplishes load balancing. Furthermore, modifications to the access networks and the access routers are not necessary in νLIN6. Thus, νLIN6 is suitable for the environment where it is difficult to predict the situation of network mobility and to modify the access networks.

νLIN6 was implemented on NetBSD 2.0 Release and KAME IPv6 stack. The overhead of the communication procedure of νLIN6 was measured. The results of the measurement indicated that νLIN6 provided the mobile nodes and the mobile networks with transparent communication with slight extra overhead compared to IPv6 communication.