# QoS Framework for Supporting Intra-Domain Mobility


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## ABSTRACT

In recent years, various hierarchical mobility management protocols have been proposed [1, 5] to reduce handoff latency and the signaling overhead of frequently roaming hosts by localizing most mobility management-related signaling within a wireless access domain. Currently most of these protocols focus primarily on ensuring uninterrupted network-layer connectivity and do not provide any integrated form of QoS support. Mobile users on next-generation cellular networks will, however, require not only seamless mobility but also varying levels of QoS guarantees.

In this study, we present the development of such an integrated QoS support for the Intra-Domain Mobility Management Protocol (IDMP), which has recently been proposed [2, 4] as an alternative two-level hierarchical mobility management solution. The fundamental architectural design of the QoS framework was presented in [3]; here, we focus on a theoretical analysis of this Differentiated Services (DiffServ)-based framework, as well as an experimental performance evaluation using a prototype implementation.

In IDMP, each mobile node (MN) is assigned two distinct transient care-of addresses. The global care-of address (GCoA) is associated with a specialized node called the Mobility Agent (MA), which provides a stable gateway to the Internet. Subnet agents (SA) located at the wireless access edge provide the MN an additional local care-of address (LCoA) to handle intra-domain mobility. The IDMP's QoS framework uses a centralized Bandwidth Broker (BB) to perform admission control and resource provisioning for different traffic classes within the access network. To provide a comparative understanding of IDMP's QoS mechanism and signaling load, we have used Cellular IP [1] (without any QoS support) as an alternative and representative micro-mobility (or intra-domain) protocol.

In the experimental performance evaluation, we studied various QoS metrics such as the handoff latency and impact of the intra-domain handoff on TCP throughput. To study the QoS-specific overheads, we experimented with both the QoS-aware version of IDMP as well as the base implementation of IDMP that provides no QoS-specific processing or signaling.

IDMP's intra-domain signaling cost has also been analyzed and compared with Cellular IP. The mobility pattern of individual users is modelled by the fluid flow model to compute the handoff rate and paging boundary crossing rate. Signaling updates are generated whenever 1) an active MN changes its point of attachment, 2) an idle MN crosses a paging boundary, 3) an idle MN reverts to he active state and sends outgoing data, 4) an idle MN is paged by the MA or gateway base station for incoming data destined to it. Since the message length and the distance that a message has travelled also contribute to the total signaling cost, we measured the signaling cost in the unit as *bytes*hops/second*.

The results show that IDMP's QoS-related signaling does not appreciably increase the handoff latency or packet losses. In addition, QoS support can be achieved with only a marginal increase in the signaling cost, especially over the bandwidth-constrained wireless links, compared with other alternative micro-mobility protocol with no QOS support.



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