6.1 Summary of key contribution and indicative results

Network layer mobility protocol, application layer mobility protocol and local mobility protocols can operate independently without interacting with each other. However, each of these mobility protocols has its own pros and cons. For example, network layer mobility protocol such as MIP [Per02c] needs additional networking element (e.g., home agent) in the home network to support terminal mobility and is thus not optimized; application layer mobility protocol such as SIP [SW00] is best optimized to work for real-time application (e.g., VoIP) but cannot support mobility for TCP-based traffic in its current form. Local mobility protocol such as cellular IP [CGK*00] cannot support mobility across subnets or inter-domain. An integrated mobility management scheme whereby a mobile can use any of these mobility protocols based on certain policy (e.g., type of movement, application type) will enable a mobile to use the best features of each of these protocols and thus will offer optimized handoff performance.

I developed a multilayer mobility management scheme that uses cross layer triggers from data link layers and application layers and optimizes several handoff operations, namely address configuration, layer 3 binding update and media rerouting. My proposed mechanism uses a policy-based approach based on the mobile’s movement pattern and type of application and executes the mobility protocol that is most appropriate to be used under a specific network and application environment. This mechanism uses SIP-based application layer mobility to support real-time traffic and MIP-LR-based mobility to support non-real-time traffic during inter-domain movement while it uses the local mobility management protocol (MMP) [WWD*02] to support real-time and non-real-time traffic during intra-domain and intra-subnet movement.

My proposed multilayer mobility mechanisms have the following key advantages.

- My proposed mechanism increases the data throughput by 50 percent under
high mobility scenario by reducing the binding update traversal during intra-domain mobility and uses the lower layer triggers such as information from the layer 2 beacon id to determine intra-domain and inter-domain mobility based on gateway’s identifier.

- My proposed mechanism expedites the discovery operation by discovering layer 3 point of attachment while discovering layer 2 point of attachment using the optimization by way of parallelism and reduces the packet loss during handover.

- Using the application layer triggers, my proposed mechanism uses the mobility protocol that is optimized for a specific type of application (e.g., SIP for RTP-based traffic and MIP for TCP-based traffic).

After I developed the proposed policy-based mobility management scheme back in 2001, few other integrated mobility management schemes were developed by Politis et al. [PCA+04] and Lee et al. [LLC03] that use SIP for personal mobility and MIP for terminal mobility and carry SIP registration information as part of MIP binding update. However, none of these existing approaches use any cross layer triggers to optimize the handoff performance nor do they provide throughput increase comparable to experimental results from my proposed mechanisms.

In the rest of the chapter, I describe the details of my proposed mechanisms, explain a few integrated mobility management schemes that use a combination of SIP, MIP-LR and micro mobility protocol (MMP), cite some related work and demonstrate the results from the experimental systems that I built.

6.2 Introduction

The proposed multi-layer integrated mobility management scheme is designed keeping in mind the requirements for real-time and non-real-time traffic. Currently, there is no frame-