

Efficient Mobility Management Schemes for Personal Communication Systems

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Abstract

Personal Communication Systems (PCS) enable people to communicate independent of their location. For tracking the location of mobile users the system must maintain a Location Management mechanism, which maps user addresses to their current location. The increasing population of mobile users leads to congestion problems in these systems, and motivates the development of more efficient management schemes. This work presents two novel Location Management schemes. The first one is a hierarchical scheme, in which every level of the hierarchy represents a partition to geographic regions. Within each level of the hierarchy the system records the location of every mobile user to a certain degree of accuracy. The degree of accuracy is increased as we go down the levels until we reach the node to which the mobile user is attached. The second is a hybrid scheme that merges the hierarchy scheme with the home location server approach. For both strategies, we develop distributed procedures for locating the mobile users (termed the Search operation) and updating the system location records (termed the Update operation) with user movements. The proposed schemes guarantee upper bound on the procedures costs: The amortized complexity of the mobile user update operations is $O(\text{Move} \log \text{Move})$, where "Move" is the total geographic distance that the mobile user has traveled. The upper bound of a search operation is linear with the distance between the search originator and the target node. These upper bounds do not depend on the network size. Experimental results also show that the proposed schemes yield lower average overhead for both the search and update operations than the other methods described in the literature. The management system is also suitable for supporting any cast and territory restricted users.