Taylor & Francis
Taylor & Francis Group

A Novel Location Management Scheme for Wireless Mesh Networks

WEIQI HU, SHIHONG ZOU, and SHIDUAN CHENG

State Key Laboratory of Networking and Switching, Beijing University of Posts and Telecommunications, Beijing, P.R. China

Conventional location management schemes are not designed for Wireless mesh networks and result in considerable signaling cost if used directly in the circumstance. In this paper, a Cluster-based location management scheme is introduced, which takes adequately into account the characteristic of the mesh structure. Numerical result reveals that the proposed scheme enables to significantly lessen the signaling cost.

Keywords   Location management; Mesh; Cluster

1. Introduction

One of the most challenging problems is location management for wireless mesh networks, which are gaining increasing popularity for its reliability, scalability, and low upfront investments. Many researches have been done and many location management schemes have been proposed in recent decades. However, the existing schemes are designed for traditional networks in which all the infrastructure nodes are connected by wired fashion. Serious matters of performance of the system would occur if the schemes are directly used in wireless mesh networks.

2. Cluster-Based Location Management Scheme

Now we introduce a Cluster-based location management scheme to decrease signaling costs in the networks that mobile users access the external network in wireless multi-hop fashion.

Utilizing similarity of path of transmission between the cells and BS, we propose the concept of Cluster, which is a partition of LA (Location Area) and serves as the elementary unit of paging in the scheme. Cluster is a set of adjacent cells in LA. Each of LA is partitioned to a Central Cluster and several Margin Clusters. We give a formalized partitioning arithmetic and clarify its rationality. Then, the paging tree (P-tree) is designed based on the quasi-multicast fashion to distribute the signaling.

In the schemes, mobiles perform static, LA-based location update scheme. Clusters Paging precedence is sorted based on the residence probability of target mobile and the maximum of tolerated delay of paging. Performance analyses show that a Cluster-based scheme brings much lower cost than other two schemes, a maximum of 78.42%.

Address correspondence to Weiqi Hu, State Key Laboratory of Networking and Switching, Beijing University of Posts and Telecommunications, Beijing, 100876, P.R. China. E-mail: hu_weiqi@hotmail.com
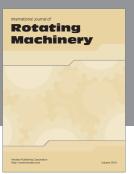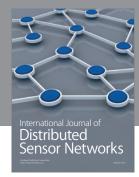
3. Conclusion

In wireless mesh networks, new challenges should be faced which result from the difference of the connection mode between infrastructure nodes from in traditional networks. Through partitioning a LA into aggregative Clusters and designing P-tree serving as default signaling transmission paths, the Cluster-based scheme proposed in this paper improves the location management performance and keeps the transmission robustness and flexibility of such networks at the same time. Numer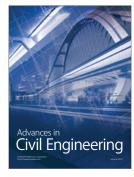ical results support the above.