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An efficient metric-based (EM-B) location management scheme for wireless cellular networks

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ABSTRACT

In the current era, the wireless cellular network is gaining much attention in the network mobility for qualitative service. Towards enhancing the QoS and narrowing the dilemma of network management (location management) an efficient metric-based location management technique is introduced in this paper to capture the current location of mobile subscribers. The attributes of this technique are based on metrics calculation and location management message routing path determination. First, the current mobile switching center will calculate the shortest metric-based path between current and master (previous) location of mobile terminals (user), thereafter it performs the location management procedure through the optimal suggested path by the mobile switching center. This proposed technique will reduce the signaling cost, registration delay, call setup delay, network overheads and total location management cost. The proposed analytical model checks the scalability and effectiveness of proposed system over certain attributes and a comparison is made with the existing available techniques.

1. Introduction

In the wireless personal communication system (PCS), the user deserves reliable communication during the movement of mobile nodes (MN)/mobile terminal (MT) and it needs frequent database update and continuous monitoring to determine the current location of the MT. These regular tasks are known as mobility management, and it uses the network backbone of base station (BS) to enhance the Quality of Service (QoS) of call session setup, and end to end communication. It is one of the greatest challenges of PCS service provider to supply an increasingly diverse portfolio of service to exponentially growing number of users under the limited spectrum (Araujo and Marca, 2000). So, the mobility management is mandatory and it is an embedment of two tasks: radio mobility or handoff management and network mobility or location management (Safa et al., 2001; Markoulidakis et al., 1997; Huang et al., 2008; Zhang et al., 2010; Wu et al., 2002). The seamless roaming refer to the fact that MT could perform handoff with minimum disruption time, low packet loss, limited handoff blocking rate, frequent and effective database updates and minimum signaling cost and effective follow-up procedure (Ezzouhairi et al., 2010).

The LM has two parts, they are as follows: location update (LU) or location registration (LR) call delivery or paging (Biswash and Kumar, 2009, 2010; Lai and Wu, 2006). The location update is the procedure to inform the network about the current position of the MT and this update is performed in the database of networks. The paging is the process to look after (monitoring) the MT inside the location area (LA) to deliver an incoming call to the MT. The location management (LM) is mainly categorized in two types: static scheme and dynamic scheme (Biswash and Kumar, 2009). The dynamic LM schemes were first analyzed by Bar-Nor et al. (1994), which was based on a linear model. Thereafter, several LM schemes have been frequently proposed to minimize the LM cost and enhance the QoS. Among them, three basic dynamic schemes are widely acceptable; they are as follows: movement-based scheme (Akyildiz et al., 1996), time-based scheme and distance-based scheme (Bar-Nor et al., 1994). It is well known that the distance-based LM is an effective technique than others.

In the above three schemes, MT performs a location update whenever the number of crossed cell borders, the elapsed time and the traveled distance exceeds a predefined threshold. It has been proved in Markoulidakis et al. (1997), that the distance-based scheme achieves better performance compared with the other two schemes. Much effort has been already put into improving the distance-based scheme. Examples include the adaptive distance-based scheme (Wong and Leung, 2001), the predictive distance-based scheme (Liang and Haas, 2003) and the hybrid schemes based on distance, movement, time and other factors (Liu and Bui, 2003; Rose, 1999).

In Ho and Akyildiz (1995), the authors studied the distance-based location update scheme with selective paging (SP) and geometrically distributed call arrivals procedure. In Akyildiz et al.

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