Distributed Transaction Processing in Mobile Computing Environment

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Abstract. Mobile embedded systems increasingly use transactions in applications like mobile commerce, banking or other commercial applications. A transaction in a distributed environment may involve multiple parties, data servers, where its operations are executed. In these transactions, besides fixed ones, multiple mobile devices can be involved as full participants.

In the execution of transactions the key issue is the protocol that ensures atomicity. Transaction Commit on Timeout (TCOT) protocol decreases the number of wireless messages, but does not consider mobile hosts as active participants in the execution of transactions. Two-Phase Commit Protocol for Mobile Wireless Environment (M-2PC) requires simultaneous connection of all mobile participants at the beginning of a transaction and does not provide adequate management of mobility and failures caused by network disconnection, nor a mechanism to control the competitiveness of distributed transactions. Fault-Tolerant Pre-Phase Transaction Commit (FT-PPTS) protocol, as well, does not provide adequate management of mobility, i.e. when mobile hosts are disconnected from the fixed network they block resources on the fixed participants for an undefined period of time, leading to an increased number of mobile transaction aborts. Similar efforts include "concurrency control without locking" (Moiz and Nizamudin), "scheduling transactions in mobile distributed real-time database systems" (Xiang et al.), etc.

In this paper we propose a communication model in mobile environment where mobile hosts ad-hoc communicate with each other and communicate with the wired network via wireless channels. We consider system model for a mobile distributed environment consisting of a set of mobile hosts (MH) and a set of fixed hosts (FH), where MHs communicate with FHs through Mobile Support Stations (MSS) via wireless channels. In addition, MHs communicate directly with each other via wireless channels, and as soon as they enter a geographical area out of the coverage of any MSS, they try to connect to other MH which is in the covering area of any MSS.

We present the execution of a mobile transaction under the proposed scenario. We expect that mobile transaction execution in our model will reduce the blocking time of resources at the fixed devices, provide fast recovery from failures owing to mobility of mobile devices and increase the number of committed mobile transactions.

Keywords: Distributed transactions, mobile computing environment, ad-hoc communication