Chapter III

Transactional Database Accesses for M-Commerce Clients

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ABSTRACT

Advances in wireless communication technologies in the past decade have led to the emergence of e-commerce applications that can be executed on mobile handheld devices. A major class of this new type of applications, commonly known as mobile e-commerce or m-commerce applications, relies on access to one or more database servers. Although conventional database technologies can still serve for applications in this evolving context, some of the techniques need to be adapted to the new environment to take advantage of the characteristics of the mobile environment or to combat the inherent limitations in such an environment. This chapter explores the appropriate mechanisms to be supported by database servers in the mobile environment and the generic architecture that can suit such a need. In particular, we focus our discussion...
on an important class of database applications, namely, transaction processing, which ensures the atomicity and other desirable correctness criteria of the database accessing activities. Furthermore, the concept of transaction processing is generalized to encompass accessing multiple databases while staying within the context of a mobile computing platform. A generic architecture that supports the necessary features is described. Relevant issues on the broadcast database and the disconnected processing of transactions are also considered.

**DATABASE ACCESS IN A MOBILE ENVIRONMENT**

Recent advances in wireless communication technologies, both the hardware and software, have resulted in the prosperity of the mobile computing paradigm. Mobile clients may be based on the resource-rich laptop computers communicating with the wireless network access points via a high bandwidth IEEE 802.11 wireless LAN, or resource-poor PDA or WAP (Wireless Application Protocol) devices communicating with a fixed network via low bandwidth wireless modems, using cellular phones. Classifying the mobile environment based on the computational power of the client device and the bandwidth of the communication network yields four different types of environments, as illustrated in Table 1.

In Table 1, the computational model exhibited by laptop computers with a high bandwidth wireless network is almost the same as the conventional distributed computing model, except for the added dimension of client mobility. Research, therefore, is focused on the management of the client location and providing location-dependent services (Imielinski and Badrinath, 1992). Moving away from the high bandwidth environment with relatively static mobile clients, quite a significant amount of research work in the past decade has been focused on the mobile environment where laptop computers interact and process data through low bandwidth networks using, for instance, wireless modems. The movement of clients is much more

<table>
<thead>
<tr>
<th>Computational Power</th>
<th>High</th>
<th>Low</th>
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<tbody>
<tr>
<td>Bandwidth</td>
<td>Laptop under wireless LAN</td>
<td>PDA under wireless LAN or 3G infrastructure</td>
</tr>
<tr>
<td>High</td>
<td>Laptop using wireless modem</td>
<td>PDA/WAP device using cellular phone</td>
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